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日本古生物學會報告
(Transactions of the Palaeontological Society of Japan)

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62. 伊吹山及びその附近の紡錘蟲石灰岩の化石に就て （豫報）

關　武　夫

（昭和 13 年 2 月 12 日講演，2 月 12 日受理）

伊吹山及びその附近は地質構造上興味ある地域として古くは小藤博士，中村教授，近くは竹山學士により貴重なる研究が發表されてゐる。又小澤，小林兩博士も西南日本地帶構造上注目すべき地域なる事を論及されてゐる。

著者は嘗て東北帝大地質古生物學教室卒業論文題目として赤坂町，醒ケ井町を連ぬる線を略ゝ南限とし北は揖斐川流域に亙る地域の地質を矢部先生御指導の下に研究した。

本地域の地質構造は極めて錯雜してゐるが各所に石灰岩の lens を胚胎し，その石灰岩中の化石は層序決定の上に又構造の解釋の上に重要なる役割を演ずるものである。

産出する化石は有孔蟲類・珊瑚類・蘚蟲類・腕足類・腹足類等多岐に亙るも最も豐富に産出し，且つ最も重要なるは勿論紡錘蟲類である。其等化石の詳細なる研究は未だその途中に在る故此處ではその主なるものを列擧し，他地域との對比に役立てようと思ふ。

本地域化石産地及び主なる化石は次記の如し（東部より）

1. 岐阜縣揖斐郡富秋村石山

Verbeekina verbeeki GEINITZ
Neoschwagerina craticulifera (SCHWAGER)
N. nipponica OZAWA
Schwagerina cfr. *richthofeni* (SCHWAGER)
S. sp.
Schubertella giraudi (DEPRAT)
Gromospira sp.
Tetrataxis sp.
Textularia sp
Climacammina sp.
Mizzia velebitana SCHUBERT
Gastropoda

2. 岐阜縣揖斐郡小島村室臺

Schwagerina japonica (GÜMBEL)
Neoschwagerina cfr. *craticulifera* SCHWAGER

3. 岐阜縣揖斐郡久瀬村津汲附近

化石の保存狀態悪く鑑定に堪へざるものが多い。

Schwagerina cfr. *richthofeni* (SCHWAGER)
S. sp.
Neoschwagerina? sp.
Mizzia? sp.

4. 岐阜縣揖斐郡久瀬村川尻附近

Neoschwagerina craticulifera (SCHWAGER)
N. cfr. *nipponica* OZAWA
N. cfr. *simplex* OZAWA
Schwagerina japonica (GÜMBEL)
Schwagerina kraffti (SCHELLWIEN)
S. cfr. *incisa* (SCHELLWIEN)
S. sp.
Schubertella sp.

5. 岐阜縣赤坂町金生山

小澤博士の詳細なる研究もあり，且つ著者は未だ自分の採集品に目を通してゐないので省略する。

6. 岐阜縣不破郡岩手村大石北方

Foraminifera
Fusulinella biconica HAYASAKA
Staffella cfr. *mölleri* OZAWA
Bradyina sp.
Textularia sp.
Tetrataxis sp.

Coral
Nagatophyllum cfr. *satoi* OZAWA
Chaetetes sp.
Prismatophyllum? sp.
Bryozoa
Gastropoda

7. 伊吹山

上，下に二分する事が出來る。

(A) 上部石灰岩中よりは

Yabeina n. sp.
Neoschwagerina craticulifera (SCHWAGER)
Neoschwagerina margaritae DEPRAT
Neoschwagerina cfr. *colaniae* OZAWA
Verbeekina verbeeki (GEINITZ)
Pseudodoliolina ozawai YABE and HANZAWA
Schwagerina japonica (GÜMBEL)
S. ambigua (DEPRAT)
S. subobsoleta var. *okuboensis* (OZAWA)
S. n. sp. α
Schubertella ibukiensis n. sp.
S. simplex LANGE

Fusulinella n. sp.
Codonofusiella paradoxica DUNBAR and SKINNER
Endothyra sp.
Tetrataxis sp.
Climacammina sp.
Cribrogenerina sp.
Textularia sp.
Glomospira sp.
Spirillina sp.
Mizzia velevitana SCHUBERT
Coral
Gastropoda

(B) 下部石灰岩中よりは

Neoschwagerina nipponica OZAWA
N. craticulifera (SCHWAGER)
Doliolina ovalis DEPRAT
Schwagerina kraffti (SCHELLWIEN)
S. multiseptata (SCHELLWIEN)?
S. tschernyschewi (SCHELLWIEN)
S. granum-avenae (ROEMER)?
Schubertella giraudi (DEPRAT)
S. simplex LANGE

Schubertella omiensis n. sp.
Staffella sp.
Climacammina sp.
Tetrataxis sp.
Glomospira sp.
Endothyra sp.
Yatzengia sp.
Mizzia velebitana SCHUBERT
Gastropoda

8. 滋賀縣坂田郡春照村大清水岩佐山

Neoschwagerina nipponica OZAWA
N. cfr. *simplex* OZAWA
N. craticulifera SCHWAGER
Schwagerina vulgaris var. *fusiformis* (SCHELLWIEN)
S. erucaria (SCHWAGER)
S. kraffti (SCHELLWIEN)

Schwagerina cfr. *kozui* (DEPRAT)
S. cfr. *complicata* (SCHELLWIEN)
S. multiseptata (SCHELLWIEN)
Triticites sp.
Schubertella giraudi (DEPRAT)
Bryozoa
Coral

9. 滋賀縣坂田郡春照村岩倉山

附近は陸軍用地なる爲，充分なる採集は不可能であつた。

Schwagerina (*Pseudofusulina*) sp.
Schubertella sp.

10. 滋賀縣坂田郡柏原町須川

Schwagerina kraffti (Schellwien)
S. sp.
Triticites sp.

11. 滋賀縣坂田郡柏原町大野木の東

Schwagerina (*Pseudofusulina*) n. sp. *β*
S. kraffti (Schellwien)
S. japonica (Gümbel)?
Schubertella simplex Lange
Staffella sp.

12. 滋賀縣坂田郡柏原町大峰山

Schwagerina kraffti (Schellwien)
S. japonica (Gümbel)
S. n. sp. *β*
Schubertella sp.
Bryozoa

13. 滋賀縣坂田郡柏原町村木南方

Schwagerina (*Pseudofusulina*) n. sp. *β*
Doliolina aliciae Deprat
Schubertella sp.
Staffella sp.
Bigenerina sp.
Cribrogenerina sp.
Endothyra sp.
Mizzia? sp.

14. 滋賀縣坂田郡東黑田村万願寺

Schwagerina kraffti (Schellwien)

15. 滋賀縣坂田郡東黑田村長岡

Schwagerina n. sp. *β*
Textularia sp.
Mizzia? sp.

16. 滋賀縣坂田郡東黑田村大鹿

Schwagerina vulgaris (Schellwien)
S. sp.

17. 滋賀縣坂田郡西黑田村 "ヤダニ"

Schwagerina vulgaris var. *fusiformis* (Schellwien)

18. 滋賀縣醒ケ井町北側採石場

Paraschwagerina oblonga (Ozawa)
Schwagerina vulgaris (Schellwien)
S. anderssoni (Schellwien)
S. tschernyschewi (Schellwien)
Schwagerina valida (Lee)?
Schubertella? *samegaiensis* n. sp.
Pseudoschwagerina sp.

以上の化石よりその示す時代を考察し且つ各石灰岩の對比を試みるならば，Loc. No. (6)（岩手村大石）はその產出する紡錘蟲類殊に珊瑚類より Moscovian より若からずと考へられ，本地域秩父古生層の最下部を示すものである。

Loc. No. (9)〜Loc. No. (18) の化石は何れも從來の Uralian を指示するものであり，其等の間に上下關係を認める事は困難であるが，Loc. No. (11)（大野木の東），及び Loc. No. (12)（大峰山）よりは *Schwagerina japonica* (Gümbel) を產するを以て比較的上位を示すものであらう。又 Loc.

Fossil Zones	Important Fossils	Locality
IV. Zone of *Neoschwagerina craticulifera* & *Schwagerina japonica*	*Yabeina* n. sp., *Neoschwagerina craticulifera*, *Verbeekina verbeeki*, *Pseudodoliolina ozawai*, *Schwagerina japonica*, *Schwagerina subobsoleta* var. *okuboensis*, *Fusulinella* n. sp. *Codonofusiella paradoxica*, etc.	伊吹山上部 富秋村石山
III. Zone of *Neoschwagerina nipponica* & *Schwagerina krafti*	*Neoschwagerina nipponica*, *Doliolina ovalis*, *Schwagerina krafti*, *Schubertella simplex*, etc.	伊吹山下部，春照村大清水 小島村室台，川尻附近
II. Zone of *Paraschwagerina oblonga* & *Schwagerina vulgaris*	*Paraschwagerina oblonga*, *Doliolina aliciae*, *Schwagerina vulgaris*, *S. krafti*, *S.* n. sp. *β*. etc.	大峯山，大野木東方，須川，村木南方，萬願寺，長岡，西黑田村 " ヤダニ，" 大鹿，醒ケ井北側
I. Zone of *Fusulinella biconica*	*Fusulinella biconica*, *Staffella* cfr. *mölleri*, *Bradyina* sp.	岩手村大石

No. (18)（醒ケ井）は明かに從來の "*Schwagerina*" horizon（今日の *Pseudoschwagerina* and *Paraschwagerina* horizon）で比較的下位を示すものと考へられ，其他の Locality はその中間に入るものと思はれる。

伊吹山石灰岩下部は明かに小澤博士の Nn Zone に對比さるゝ fauna を有し，下部二疊紀を指示するものであらう。而して Loc. No. (8)（大清水岩佐山），Loc. No. (2)（小島村室台），Loc. No. (3)（津汲），Loc. No. (4)（川尻）は何れも之と略同層準である。

伊吹山石灰岩上部は本地域秩父古生層の最上部を示すもので，小澤博士の Nc, Nm 及び Ng の一部に對比され，時代は中部二疊紀と考へられる。Loc. No. (1)（富秋村石山）は略ゝ之と同層準である。

以上要約すれば本地域紡錘蟲石灰岩には 4 化石帶が認められる。各化石帶の主なる化石及び產地を擧げれば上表の如くである。

對 比

1. 鈴鹿山地との對比

本地域と最も密接なる關係に在る鈴鹿山地の地質及び構造は最近瀧本學士により發表された。同學士は靈仙層を Artinskian〜Saxonian であらうとされてゐる。それは恐らく *Paraschwagerina oblonga* (Ozawa) 並に *Mizzia velebitana* Schubert の產出に基くものと推察される。*Paraschwagerina oblonga* は小澤博士により秋吉臺の *Sumatrina* subzone の下部に初めて發見されたものであるが，本地域醒ケ井に於ては *Schwagerina vulgaris* (Schellwien), *Pseudoschwagerina* sp. 等と伴出するを以て所謂從來の "*Schwagerina*" horizon を代表するものと考ふべきであらう。又靈仙層は上下を通じて伊吹山の如き *Neoschwagerina* fauna を發見する事が出來ない。以上より靈仙層は全體として本地域の醒ケ井・大鹿等と對比されるものであらう。

靈仙層分布地域の東方に在る幾里谷及び岩須北西の石灰岩は本地域の小島村室臺のものと對比さ

れるものであらう。

2. 關東山地・秋吉臺 赤坂との對比

本地域化石帯第1帯は關東山地の*Fusulinella bocki* zone, 秋吉臺のC_2に對比して先づ間違ひなく。第2帯は關東の*Schwagerina vulgaris* zone, 秋吉臺のC_3に對比されるであらう。第3帯は關東の*Neoschwagerina craticulifera* and *Schwagerina ambigua* zoneの下部に，秋吉臺のCPg及びP_1の一部に，赤坂のNn zone及びNc zoneの一部にそれぞれ對比され。第4帯は關東の*Neoschwagerina craticulifera* and *Schwagerina ambigua* zoneの上部, *Neoschwagerina margaritae* zone及び*Yabeina globosa* zoneの一部に，又秋吉臺のP_1の上部，P_2，及びP_3の一部に，赤坂のNcの上部, Nm, 及びNgの一部に該當するものであらう。

Preliminary Report on the Fauna of Fusulina Limestone from Mt. Ibuki and its Adjacent Areas

(Résumé)

By

Takeo Seki

1. There are many large and small fusulinid-bearing limestone lenses in the Titibu System of this region. The fossil localities and important fossils are enumerated.

2. The geological ages of the limestone lenses are found to range from the Moscovian to the Middle Permian, on the evidence of the Fusulinids contained in them.

3. Four fossil zones are distinguished.

   (Ⅳ) Zone of *Neoschwagerina craticulifera* (Schwager) and *Schwagerina japonica* (Gümbel)
   (Ⅲ) Zone of *Neoschwagerina nipponica* (Ozawa) and *Schwagerina kraffti* (Schellwien)
   (Ⅱ) Zone of *Paraschwagerina oblonga* (Ozawa) and *Schwagerina vulgaris* (Schellwien)
   (Ⅰ) Zone of *Fusulinella biconica* (Hayasaka)

4. These fossil zones are correlated with those of Nagato, Akasaka, the Kwanto and Suzuka Mountainlands.

63. 日本産化石馬に就いて

鹿間時夫

（昭和 13 年 2 月 12 日講演，2 月 12 日受理）

緒言

馬は羚羊と共に支那大陸に化石として多數産し種類も多く層位上重要視されて居るが，逆に日本群島では他の化石獸類に比し貧弱であると云ふ極端なる1例であらう。化石象に甚だ惠まれた環境が之等の主として草原棲の動物進入（又は移動）に不適であつたであらう爲めと思はれる.[1] 併したとひ斷片でも之が産出する場合は大陸との對比や層位上相當重要な意味を有する事は忘れてならない。筆者は東北帝大地質學古生物學教室の哺乳動物標本整理に際し，化石及び化石らしき2個の馬齒標本を知り得たので，玆に其の簡單なる記載をし並びに若干の考察をして置き度い。遺憾ながら標本甚だ斷片的なる爲系統的位置其他に關し斷言出來得ないのは已むを得ない事である。

本稿を草するに當り御懇篤なる校閲の勞を賜つた矢部先生に厚く感謝致します。

標本

1. 秋田縣南秋田郡豐川村槻木産（第1圖a及び第2圖a）

標本は上左頰齒の齒根部に近い部分の破片で，片山量平理學士の採集品である (Reg. No. 36729)。槻木保留田土瀝青層の産，地表より5尺下にある土瀝青中にて發見された由であり，多分次の化石群と共に産するものであらう.[2]

Palaeoloxodon namadicus yabei (MATSUMOTO)
Sus nipponicus nipponicus MATSUMOTO
Cervus (*Sika*) *ezoensis* HEUDE
Canis sp.[3]

松本博士によると，附近の段丘砂礫層の下部を構成する泥炭に富む砂質粘土層が谷底部に於いて2枚の土瀝青層を含み，此の中に獸類化石を含有する由である。槻木の化石哺乳動物群は象等より觀れば *Stegodon* の卓越した時代より後期・恐らく中部洪積世を示すであらうと思はれ，此の時代には小豆島や上部葛生層等に北支・滿洲系の動物が出現して居るのであるが，かゝる時代に恰かも此の事實を强調する如く東北地方に草原性の馬が出現して居るのは興味あり且重要な事である。

琺瑯質部は黑褐色を呈し，同一地産 *namadicus* 象齒の琺瑯壁と狀態酷似する。標本は藍鐵鑛にて充塡されて居るが，齒冠部の大半は破損し，只上面より觀て（第2圖a）僅に形狀を推察し得るのみである。長さ22粍・幅23粍・高さ31粍で，元來は長さ幅共にもつとあつたらしく，大體齒冠面は正方形と云ふより長方形に近かつたらしい。齒根の高さは，內柱12粍・外前柱・外內柱共に9粍である。原丘 protocone は扁平で馬齒としては巨大でもなく小形でもなく，所謂 *caballus* の

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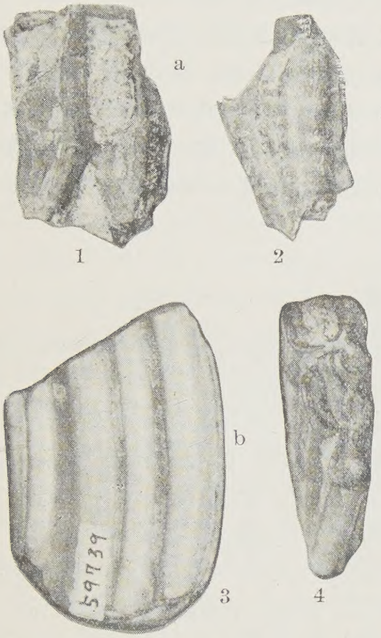
[1] 鹿間時夫：化石象産地としての日本群島。科學，第7卷，第6號，1937, pp. 215-216.

[2] MATSUMOTO, H.: On Some Fossil Mammals from Tsukinoki, Ugo. Sci. Rep. Tôhoku Imp. Univ., Sendai, Ser. II (Geol.), Vol. III, No. 1, 1915, pp. 39-48.

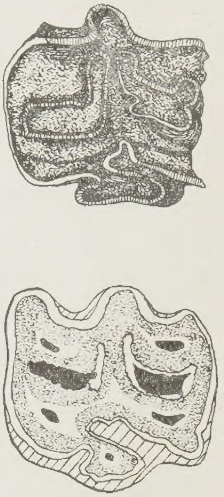
[3] 齋藤　弘：石器時代犬の體格とヤマイヌ鑑別私見. 日本犬，第5卷，第4號，1936, p. 14.

原丘やハルピン顧郷屯產馬齒 *Equus przewalskii* Poliakoff? の原丘の形に似て居る。琺瑯褶襞は比較的簡單である。所謂 *caballus* や *E. hemionus* の褶襞に可成り類似して居る。齒冠の前部卽ち parastyle, paraefossette, protoconule は破損して原形を窺ひ難いが，比較的に褶襞が簡單である。*Equus leptostylus* Matsumoto[1] や *E. sanmeniensis* Teilhard & Piveteau[2] の其にも及ばない如くである。又顧郷屯產馬齒の褶襞は本標本よりは複雜の樣である。松本博士によると，洪積世の馬には大體2系あり，*E. plicidens*, *E. süssenbornensis* 等褶襞複雜にて原丘の大型なるものと，*E.* cf. *stenonis* Cocchi,[3] *E. leptostylus* 等褶襞簡單にて原丘小型なるものとに分ち得るとの事である。本標本は大さ•原丘の形狀•褶襞の狀態等を考慮に入れると *leptostylus*, *sanmeniensis* 等の東洋產化石馬と異り，恐らく *przewalskii* とも異り，或は *hemionus* か又は Celtic Pony の如き小型の馬（亞屬 *Equus* にて所謂 *caballus* 中に入る）であるかも知れない。兎に角，馬の分類は毛皮•體格•蹄•鬣•頭骨等を主要要素として居り，分離した齒の斷片的標本の如きを以て其の系統的位置を知る如きは餘程の比較標本の蒐集せられざる限り不可能に近いので，玆には只 *Equus* sp. として置き度い。第2圖 b は現世の畜馬の右上第 4 小臼齒の齒根に近い部分の切斷面を上より觀た圖で比較に揭げて置く (Reg. No. 59746).



第 1 圖

a. *Equus* sp. 上左頰齒秋田縣槻木產
　1. 外側　2. 內側
b. *Equus* sp. 下左第 3 大臼齒茨城縣助川附近產
　3. 內側　4. 上後側



第 2 圖

a. *Equus* sp. 槻木產頰齒の齒冠面
b. *Equus caballus* L. 右上第 4 小臼齒の齒根に近き部分の切斷面の上側

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[1] Matsumoto, H.: On Some Fossil Mammals from Ho-nan, China. Sci. Rep. Tôhoku Imp. Univ., Sendai, Ser. II (Geol.), Vol. III, No. 1, 1915, pp. 29–30.

[2] Teilhard de Chardin & Piveteau, J.: Les Mammifére Fossiles de Nihowan (Chine). Annales de Paléont., Bd. XIX, 1930, pp. 33–41.

[3] Boule, M.: Observations sur Quelques Equidés Fossiles. Bull. Soc. Geol. France, III Ser., 27 Tom., 1899, p. 536.

2. 茨城縣多賀郡助川附近產（第 1 圖 b）

標本は左下第 3 大臼齒にて渡邊氏の採集にかゝる（Reg. No. 59739）. 象牙質は侵蝕され，琺瑯質を露出せしめ，琺瑯質自體も水磨を受けて居り，一部には蘇苔蟲の附着するのを見ると或は海岸に打ち上げられたものかも知れない。齒質・琺瑯質共に黃褐色で光澤に富み，果して化石か否か疑はしいが，伊太利ローマ附近 Monte Sacro の中部洪積統產馬齒（Reg. No. 38904）[1] は本標本以上に生々しい外觀を呈するので，本標本も又外觀のみよりすれば化石に非ずと斷定しきる事も困難であるから，化石らしき標本として報告し度い。槻木產標本と比較され度い。長さ約 30 粍・幅約 12 粍・高さ約 43 粍で，大さ・形狀共に現世畜馬の齒と異らない。所謂 *caballus* に同定さるべきものであらう。

考察

（極東の化石馬と日本群島產化石馬との關係並びに本邦產化石馬の有する意義に關する考察）

次に本邦化石馬に關し，極東の化石馬に就いて一言して置き度い。

Equus 屬は鮮新世の舊北州に出現し，歐洲の上部鮮新世には *E. stenonis* Cocchi（英・佛・伊）・*E. süssenbornensis* Wüst（獨）等あり，又上部 Siwalik 統よりは *E sivalensis* Falc. and Caut. (Siwalik Hills・Rupar・Lehri・Pabbi Hills 等)・*E. namadicus* Falc. and Caut. (Hoshiarpur・Kangra 等) 等の大型の馬が出現して居る.[2] 支那では廣義の三門系卽ち泥河灣・Reddish Clay・周口店等に *E. sanmeniensis* Teilhard and Piveteau が現れるのが *Equus* としての最初の記錄である.[3] 之は *sivalensis* や *namadicus* 及び歐洲に *stenonis* に次いで出現する *E. robustus* Pomel 等大型馬に類し，又北米の *E. pacificus* Leidy, *E. occidentalis* Leidy, *E. giganteus* Gidley 等にも關係あり，恐らく舊北州より新北州に進入した *Equus* は *sanmeniensis* に近かつた事を想起せしめる。極東に於ける *sanmeniensis* 以前の馬は何れも *Hipparion* であり，*Hipparion* Red Clay には *H. richthofeni* Koken の外 10 種以上が知られて居る.[4] 泥河灣よりは *Hipparion* の別亞屬たる *H.* (*Proboscidipparion*) *sinense* (Sefve) が殘存して居る事が知られるが，兎に角 Reddish Clay A·B·C 各帶を通じて（中部鮮新乃至下部洪積世）榮えたのは *E. sanmeniensis* である。中部洪積世には *sanmeniensis* は姿を消し，Ordos の Sjara-Osso-Gol Sands には *E.* cf *przewalskii* Poliakoff と *E. hemionus* Pallas（蒙古の Chigtai 又は Dzigetai, Tatar の Koolan）が知られ,[5] ハルピン顧鄉屯其他の Sungari Sands にも同樣 *przewalskii* 馬類似の馬が多く產する.[6] Zdansky は更に蒙古 Hallong-Osso, Tomenlo 及び河北省 Hsi-Leang-Shang より

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1) *Equus adamaticus* Schloth., 1820 とラベルに書かれてある。*E. caballus* L. の Synonym とする人もある。

2) Falconer, H. and Cautley, P.: Fauna Antiqua Sivalensis, pt. 9, 1849.

3) Teilhard de Chardin and Piveteau, J.: op. cit.

Zdansky, O.: Equus and andere Perissodactyla. Pal. Sinica, Ser. C, Vol. VI, Fasc. 5, 1935, pp. 21–45.

4) Sefve, I.: Die Hipparionen Nord-Chinas. Pal. Sinica, Ser. C, Vol. IV, Fasc. 2, 1927.

5) Boule, M. and Teilhard de Chardin: Paléontologie. in Boule, M., Breuil, H., Licent, E. and Teilhard de Chardin, Le Paléolithique de la Chine. Arch. Inst. Paléont. Humaine, Mem 4, 1928.

6) 德永重康・直良信夫: 滿洲帝國吉林省顧鄉屯第 1 回發掘物研究報文。第 1 次滿蒙學術調査研究團報告, 第 2 部, 第 1 編, 1933, pp. 71–81.

顧鄉屯化石馬には Ordos と同樣 *przewalskii* と *hemionus* の兩種があるらしい。

同種の馬を報告して居る.[1] 本種は TEILHARD de CHARDIN によると *sanmeniensis* とは類縁なく，又大程大形でないが可成り大きな馬であり，*sanmeniensis* に代つて中部洪積世以後榮えた由であり，1879 年蒙古 Kobdo に於て其の棲息地を發見され，野生馬として有名となつたものである。ANTONIUS は *przewalskii* 馬が畜馬の Prototype の 1 であるとし，POCOCK も又蒙古馬•朝鮮馬や南露の Tarpan 等が之より導かれたとして居る。更に印度の Kathiawar Pony も *przewalskii* 馬の子孫とされて居るが，之には *E. namadicus* 其他の血縁關係もあるであらう。兎に角，中上部洪積世の極東に重きをなしたのは *przewalskii* と *hemionus* である。河南省の黄土より松本博士は *E. leptostylus* MATSUMOTO を報じられた。原模式標本は左上第 4 小臼齒 1 個であつて，博士は *przewalskii* と異る馬とされて居る。大さは長さ•幅共に 29 粍とされ，ZDANSKY の表[2] によると，SALENSKY 報告 (1902 年) の *przewalskii* 馬の第 4 小臼齒は長さ•幅共に 30 粍あり，BOULE 及び TEILHARD 報告 (1928 年) の *hemionus* の第 4 小臼齒は長さ 30 粍•幅 28 粍あるので，*leptostylus* の大さは此等と大差なく，又琺瑯褶襞も顧郷屯産馬齒の其と大差ないので，恐らく *leptostylus* は *przewalskii* 馬に屬するに非ずやとも愚考する。最近 TEILHARD de CHARDIN と YOUNG は河南省安陽の殷虚發掘品を研究發表し，多くの獸類と共に *Equus caballus* L. を報じ，松本博士の *leptostylus* も殷墟發掘品の一部であるとの前提の下に *caballus* に入れて居る.[3] 但し北支原始時代の家畜馬としての *leptostylus* なる名稱は便利であると云つて居る。

さて *E.* (*Equus*) *caballus* L. は Polyphyletic な種であり，多數の亞種に分たれて居るが，LINNAEUS の記載した瑞典の畜馬は Highland Pony や Shire Horse より馴らされ，此等は歐洲に於ける Prototype の 1 たる *E. robustus* POMEL より導かれたものである。從つて東洋に於ける畜馬に似た化石馬に對して一樣に *E. caballus fossilis* CUVIER なる名稱を附す事は，見方によつては問題であらうし，少くとも系統分類家にとつては承服し難い點かも知れぬ。*caballus* に似て非なる別種であるかも知れず又 *caballus* に近くとも *fossilis* とは區別さるべきものかも知れぬ。*leptostylus* を北支原始畜馬の學名にせんとするのも此の後者の見解に近いであらう。又 *przewalskii* 馬の子孫型が蒙古•滿洲•朝鮮にありとされる今日では，前者の見解も留意に値するであらう。

註 種の起原第 1 章に於いて DARWIN は次の如き事を云つて居る。

With respect to horses, from reasons which I cannot here give, I am with much doubt inclined to believe, in opposition to several authors, that all the races have descended from one wild stock.

此の馬は勿論畜馬の事を示すであらう。*przewalskii* 馬の野棲種發見は種の起原第 6 版出版後 7 年であるから，DARWIN 生前中は問題とならなかつたであらうと思はれる。畜馬の單源多源に關しては古來議論錯雜して居るが筆者は ANTONIUS, POCOCK に從ひ度い。東洋原始畜馬に關しては次の通りの意見が成り立つ。

Equus (*Equus*) *caballus fossilis* CUVIER
E. (*E.*) *caballus leptostylus* MATSUMOTO
E. (*E.*) *caballus przewalskii* POLIAKOFF
E. (*E.*) *przewalskii* POLIAKOFF

Hipparion は從來北米に發生し，亞細亞及び歐洲に進入したとの定說であつた。北米の Valentine beds (Mio-Pliocene) に始めて *Hipparion gratum* LEIDY が出現し，之は *Merchippus* より進化したものとされて居る。亞細亞大陸には所謂 Pontian に一樣に *Hipparion* が榮えるが，Pikermi • Samos • N. China 等の Pontian は筆

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[1] ZDANSKY, O.: op. cit., p. 48.

[2] ZDANSKY, O.: op. cit., p. 50.

[3] TEILHARD de CHARDIN, P. & YOUNG, C.C.: On the Mammalian Remains from the Archaeological Site of Anyang. Pal. Sinica, Ser. C, Vol. XII, Fasc. 1, 1936, p. 19.

Oriental authors (Pilgrim, Teilhard, Stirton)	Siwalik Series		American authors (Matthew, Osborn, Gidley, Colbert)
Pleistocene	Up.	Boulder Conglomerate	Pleistocene
Pliocene		Pinjor Zone	
		Tatrot Zone	
	Mid.	Dhok Pathan Zone	Pliocene
Miocene		Nagri Zone	
	Low.	Chinji Zone	
		Kamlial Zone	Miocene

者は支那の學者と同様最下部鮮新統とし度い。印度 Siwalik Series には Dhok Pathan Zone に最も多く，5 種類知られる。本帶を Pontian とする有力なる原因の一である。Colbert によると，猶，Chinji Zone よりも *Hipparion theobaldi* (Lydekker) が產する。[1] *Hipparion* 北米起源說は亞米利加學者就中 Matthew-Osborn 一派の强調する所であり，亞細亞大陸の *Hipparion* 含有層は Valentine beds と同時代又はより新しきものでなければならぬとは彼等の信條である。從つて Lower Siwalik の Chinji Zone は當然 Pontian であると云ふのである。歐洲及び亞細亞の學者はかゝるドグマチックな意見に迷惑せざるを得ない。今日兩者の Siwalik Series の時代に關する意見は表の如く甚だしい懸隔がある。何故に *Hipparion gratum* が世界中の *Hipparion* の祖先でなければならぬのか，筆者には不可解とする所である。Siwalik の動物群全體を考慮する場合は Pilgrim の意見は最も妥當である。動物群中の或一部のものに重みを置き之を强調する事は，一面有利でもあり，廣い對比には便利な點も多いが，之に拘泥する時は，時により甚だしい矛盾に陷いる。有利な武器は同時に有害な武器でもある。筆者は移動の方向に就いては絕對的價値を疑ふものである。*Hipparion theobaldi* こそ *Hipparion* の最古のものなりとする Pilgrim の見解，又は舊世界の *Hipparion* は Unknown *Merchippus* (Valentine beds のものと關係なき所の) より由來するものならんとする Teilhard de Chardin の見解に對し Colbert の如く頭より否定する事は賛成出來難い。Lower Siwaliks = Uppermost Vindovonian, Middle Siwaliks = Pontian, Upper Siwaliks = Astian or Uppermost Pliocene とする Teilhard de Chardin の意見は穩當であらう。由來 Siwalik Series は日本の哺乳動物含有層と關係深く，如上の見解も影響する所大と思ふ故，玆に愚見を述べて置いた。

本邦の化石馬は非常に稀である。岐阜縣平牧より *Anchitherium hypohippoides* Matsumoto が知られるが，總模式標本は左上第 3 小臼齒と左下第 4 小臼齒に過ぎない。Zdansky は山西省保德縣 Liu-Wan-Kou の *Hipparion* Red Clay より *Anchitherium* 類似の興味ある標本を報告して居るが，平牧產より遙に良好である。[2] 長野縣北安曇郡美麻村の鮮新統 (?) より *Pliohippus* (今日の所北米特有) が出たとの報告があるが，確實に然りとすれば興味ある事である。[3] 洪積世に於いても，本邦は依然として馬化石に惠まれない。朝鮮黄海道金川郡鷄井の裂罅堆積物よりは，犀と共に

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1) Colbert, E.: Siwalik Mammals in the American Museum of Natural History. Trans. Amer. Phil. Soc., N.S., Vol. XXVI, 1935.

2) Matsumoto, H.: Description of Some New Fossil Mammals from Kani District, Prov. of Mino, with Revision of Some Asiatic Rhinocerotids. Sci. Rep. Tôhoku Imp. Univ., Sendai, Ser. II (Geol.) Vol. V, No. 3, 1921, pp. 77-78.

Zdansky, O.: op. cit., pp. 17-20.

3) 德永重康: 哺乳類, 岩波講座, 地質學及び古生物學, 1934, p. 58.

德永博士により *E. caballus fossilis* Cuvier の左上第 1 及び第 2 大臼齒が報じられて居る。[1] 其々長さ 31·32 粍で大型の馬齒とされ，琺瑯褶襞は今日の畜馬と變らないとされた。明に *przewalskii* より大であるが，恐らく *sanmeniensis* 等と關係あるに非ざるやと思はれる。德永博士によると，同じく *E. caballus fossilis* Cuvier とされるものが兵庫縣氷上郡黑井村より報じられて居る。其の系統的位置は不明である。

卽ち甚だ斷片的であるが本邦洪積世の馬は確認され，廣義の *caballus* に入れられるが中には小形のものも存する。之等が *sanmeniensis* に近いか *przewalskii* や *hemionus* に近いかは，將來解決し度い所である。泥河灣式の動物群かハルヒン式の動物群か何れかに屬する事を示すであらう。既に後者の例は槻木より知られた。

本邦の介塚動物群にも馬はさう多く發見されない。古く長谷部博士の報告された所によると，尾張國熱田高倉介塚（繩紋土器文化層には *Sus nipponicus miyae* Matsumoto あり，馬は彌生式土器文化層に屬する由）から臼齒•門齒•右前肢跗骨が出で，國府遺跡より脛骨•橈骨•掌骨•臼齒等を出し，肥後國宇土郡轟村宮庄介塚より臼齒を，薩摩國出水郡出水町政所介塚より臼齒•門齒•橈骨等を出した由で，氏の四肢骨研究によると本邦特に九州の石器時代遺跡に見出される馬は矮小であつた由である。[2] 氏は「余は出水介塚の馬橈骨を檢して上述の如き特徵を擧げ，又我國古代の馬が矮小なりしことを推論し得たが，其那邊より由來せるかの問題に立入ることはできぬ。而も我石器時代の家犬が歐羅巴の石器時代末期以後各時代遺跡より發見さるゝ埣犬と同一種類と認めて可なるに，前者の馬に就ては漸く後者の青銅時代末期以後に於て始めて稍近似相をもとめ得るが如き注目すべき事柄だと思ふ」と云つて居られる。兎に角，馬の遺骨は西日本の石器時代遺跡に主として限られる樣であるが，陸前氣仙郡末崎村細浦介塚產の馬の頭骨が仙臺の敎室にあり (Reg. No. 59879)，曾根廣氏によると果して正確に介塚產か否か疑はしいとの事であるが，保存狀態が他の遺骨に似て居るので玆に報告して置く。

石器時代の本邦馬が小形であつたと共に，中部洪積の *namadicus* 象に伴つた馬も又 *hemionus* に似て小形であつた事は興味ある事と思はれる。*Sus nipponicus* Matsumoto が中部洪積世より石器時代に亙り生存した如く，槻木型の馬と同時期に生存したのであるまいか。*hemionus* の如く元來小形のものか又は *przewalskii* 型の馬が島嶼的條件により矮化したものでもあらうか硏究の餘地ある問題である。

追記　種子島に特別保護せられるウシウマ *Equus* sp. は昔，島津藩により朝鮮より移入されたものの如くで，朝鮮の化石馬中には，此の種のものの存在も考慮に値すると，直良氏は云つて居られる。面白い 1 問題であるので玆に附記する。

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1) Tokunaga, S.: Mammalian Fossils found in Limestone Caves in Korea. Proc. Imp. Acad., Vol. 5, No. 3, 1929.

2) 長谷部言人：石器時代の馬に關して，人類學雜誌，第 40 卷，第 4 號，1925.

On Some Japanese Fossil Equids

(Résumé)

By

Tokio Shikama

Fossil equid remains are very rare in the Japanese Islands, probably owing to the particular land condition that prevailed during the later Cenozoic, which is adverse to the life of equids and on the contrary favourable to that of Proboscidea. In Middle Pleistocene, some Manchurian or North Chinese elements evidently migrated into the land, as such remains are found in the Upper Kuzuü beds of Totigi prefecture, the sand and gravel bed of the Inland sea, and the Tukinoki asphalt bed of Akita prefecture. The last mentioned deposit, yielded the equine tooth now under consideration; other mammalian remains previously described from the same deposit are *Palaeoloxodon namadicus yabei* (Matsumoto), *Sus nipponicus nipponicus* Matsumoto, *Cervus* (*Sika*) *ezoensis* Heude, and *Canis* sp. This occurrence, the writer thinks, indicate that some steppe animals might have invaded into the Japanese Islands in association with the other Manchurian elements.

The very fragmental equine tooth from the asphalt bed, about 22 mm long, 23 mm wide and 31 mm high, probably belonged to a median-sized equid; it has a flat protocone as in *E. przewalskii* Poliakoff or *E. caballus* Linne, and relatively weak enamel plication, weaker than in *E. sanmeniensis* Teilhard and Piveteau or in *E. leptostylus* Matsumoto. The fossil remain may represent a species perhaps allied with *E. hemionus* or other small sized equids.

Another tooth, shown in Fig. 1 b is a left lower last molar, about 30 mm long, 12 mm wide and 43 mm high; it is quite similar to the corresponding one of *E. caballus*. It was found lying on the sandy shore near Hitati-mati, Ibaraki prefecture; it may be a fossil or subfossil, or even its being a quite recent one is by no means excluded.

In connection of the respective antiquity and sequence of *E. sanmeniensis*, *E. przewalskii* and *E. caballus*, it is questioned whether the equine tooth from Honan described under the name of *E. leptostylus* Matsumoto is not referrable to *E. przewalskii*, because the correspondent tooth of the latter species differs not much from the former in dimensions and enamel plication. Which of the various names—*E.* (*E.*) *caballus fossilis* Cuvier, *E.* (*E.*) *caballus leptostylus* Matsumoto, *E.* (*E.*) *caballus przewalskii* (Poliakoff) and *E.* (*E.*) *przewalskii* Poliakoff should properly be applied to the Anyan equid which is sometimes regarded to be a domestic form, is a question difficult to answer.

At present wide divergence of opinion exists between the American and oriental authors as to the geological age of the *Hipparion* bed of the Siwalik series; the present writer rather tends to the view held by Pilgrim or Teilhard de Chardin, as the Americans seems to him to be too arbitrary in regarding the New World as the native land of *Hipparion*. For intercontinental correlation of fauna, the use of certain single group of animals instead of the whole fauna may prove to be of considerable value, though sometimes quite dangerous.

Beside the two specimens cited above, there are some others which have previously been reported by Dr. Tokunaga, namely several specimens of *E. caballus* from Keisei, Tyôsen, and Kuroi village in Hyôgo prefecture; farther there are several remains from Neolithic sites reported by Dr. Hasebe, especially of Kyûshû, which specially attracted his attention to the small size of them. Hence one can at least safely express that some small sized horses lived in Japan from the Middle Pleistocene of the Neolithic age, contemporaneous with *Sus nipponicus* Matsumoto. The small size may be interpreted either as its specific character or as due to island life.

64. *On the Japanese Species of Elphidium and Its Allied Genera.*

By

Kiyosi ASANO

(Contribution from the Institute of Geology and Palaeontology, Tôhoku Imperial University, Sendai, Japan: Read December 18th; received December 20th, 1937.)

A study of the various collections of foraminifera now stored in the Institute of Geology and Palaeontology, Sendai, Japan, has rendered the writer possible to review the Japanese species of *Elphidium* and its allied genera, both fossil and recent.

Of many different species of *Elpidium* distinguished up to the present time from the Japanese material, valid are the following eleven species, namely:

Elphidium crispum (LINNÉ).
E. subgranulosum n. sp.
E. cf. *fabum* (FICHTE and MOLL)
E. advenum (CUSHMAN)
E. jenseni (CUSHMAN)
E. craticulatum (FICHTEL and MOLL)
E. yabei n. sp.
E. yezoense ASANO.
E. kusiroense n. sp.
Elphidiella nagaoi n. sp.
Polystomellina discorbinoides YABE and HANZAWA.

Of the mentioned forms, 1) *E. crispum*, *E. subgranulosum* and *E.* cf. *fabum* are widely distributed in Japan, both recent and fossil, 2) *E. advenum* and *E. jenseni* occur commonly in the recent or Plio-Pleistocene material from the Pacific side of Japan, but are very rare in those from the Japan Sea side, 3) *E. craticulatum* is only known from the Pacific side of Japan, both fossil and recent, 4) *E. yabei* and *Elphidiella nagaoi* seem to be confined to the Pliocene of Setana, Hokkaidô, and their living representatives are still unknown, 5) *E. yezoense* and *E. kusiroense* are only known in the fossil material from Hokkaidô and Karahuto, and 6) *Polystomellina discorbinoides* is a characteristic Pliocene form of Etigo, Japan.

Further, the species belonging to 1) and 5) find their closely related forms in the Plio-Pleistocence of the West Coast of North America, and those belonging to 2) and 3) are now living in the Indo-Pacific region.

As to the distributions of species, these seems to exist a very interesting relationship between *Elphidium* and *Cassidulina*, as previously stated by the writer;

namely some of the extinct forms of *Elphidium* treated in this article show an intimate co-existence with certain extinct forms of *Cassidulina*. Thus, *Elphidium yabei* and *Elphidiella nagaoi* are found in association with *Cassidulina yabei* ASANO and NAKAMURA and *C. setanaensis* ASANO and NAKAMURA, and *Polystomellina discorbinoides* associated with *Cassidulina yabei*, further, *E. yezoense* is found to be always associated with *Pecton takahashii* YOKOYAMA, a characteristic Pliocene mullusc of Japan.

The species dealt with in this article are derived from many geographically isolated localities, which are enumerated below in order from north to south, as follows:

I). Karahuto (a) Karagai, Tirie-gun. Coll. Y. SASA.
(b) Rutaka-mati, Rutaka-gun. Coll. Y. INAI.
(c) Minami-Rokusenzawa, Toyohara-mati, Toyohara-gun. Coll. Y. INAI.
II). Hokkaidô (a) Zarigawa, Numata, Uryû-gun. Coll. S. ENDÔ.
(b) Kaigarasawa, Kuromatunai-mura, Suttu-gun. Coll. W. HASIMOTO.
(c) Nakanosawa, ditto. Coll. W. HASIMOTO.
(d) Nakanokawa, Yubetu-mura, Suttu-gun. Coll. T. NAGAO and Y. SASA.
(e) Pirika-Eki, Tosibetu-mura, Setana-gun. Coll. T. NAGAO and Y. SASA.
(f) Hanaisi-Eki, ditto. Coll. T. NAGAO and Y. SASA.
(g) Ômagari, ditto. Coll. T. NAGAO and Y. SASA.
(h) Maruyama, ditto. Coll. T. NAGAO and Y. SASA.
(i) Minami-Kanehara, ditto. Coll. T. NAGAO and Y. SASA.
(j) Harutori, near Kusiro City. Coll. Y. SASA.
III). Aomori, (a) Utimanbegawa, Okunai-mura, Higasi-Tugaru-gun. Coll. K. ASANO.
Akita, (b) Taya, Iwamisannai-mura, Kawabe-gun. Coll. K. ASANO.
Niigata, (c) Sawane, Sado Island. Coll. Y. OZAWA.
Toyama (d) Kutta, Misima-gun. Coll. S. HANZAWA.
and (e) Natukawadani, Kitadyô-mura, Kariha-gun. Coll. S. HANZAWA.
Isikawa. (f) Simotaka-mati, Kariha-gun. Coll. S. HANZAWA.
(g) Tagawa, Konade-mura, Nisitonami-gun. Coll. M. NAKAMURA.
(h) Hôrakuzi, ditto. Coll. K. ASANO.
(i) Anrakuzi, ditto. Coll. K. ASANO.
(j) Hiradoko, Syôin-mura, Suzu-gun. Coll. T. MATUSIMA.
(k) Nagaya, Kosaka-mura; Isikawa-gun. Coll. M. NAKAMURA.
(l) Onma, Sakiura-mura, Isikawa-gun. Coll. M. NAKAMURA.
IV). Tiba (a) Sematanoseki, Sitô-mura, Itihara-gun. Coll. M. NAKAMURA.
(b) Ônuki-mati, Kimitu-gun. Coll. F. UEDA.
(c) Sanuki-mati, ditto. Coll. F. UEDA.
(d) Moroiti, Sittu-mura, Itihara-gun. Coll. F. UEDA.
(e) Tosaki, Tomioka-mura, Kimitu-gun. Coll. F. UEDA.
(f) Higasi-Kuniyosi, Sitô-mura, Itihara-gun. Coll. F. UEDA.
(g) Mandano, Makita-mura, Kimitu-gun. Coll. F. UEDA.
(h) Ititoku, Koito-mura, Kimitu-gun. Coll. F. UEDA.
(i) Nisi-Nagata, Toyohusa-mura, Awa-gun. Coll. F. UEDA.
(j) Numa, Awa-gun. Coll. S. NOMURA.
V). Kanagawa (a) Tomioka, Kanazawa-mati, Kuraki-gun. Coll. M. NAKAMURA.

(b) Hitorizawa, ditto. Coll. M. NAKAMURA.
(c) Yadu, ditto. Coll. M. NAKAMURA.
(d) Teramae, ditto. Coll. M. NAKAMURA.
(e) Nozima, ditto. Coll. H. YABE.
(f) Ueki, Tamanawa-mura, Kamakura-gun. Coll. M. NAKAMURA.
(g) Takaya, Muraoka-mura, Kamakura-gun. Coll. F. UEDA.
(h) Osikiri, Hongô-mura, Kamakura-gun. Coll. M. NAKAMURA.
(i) Asahina, Kamakura-mati, Kamakura-gun. Coll. M. NAKAMURA.
(j) Utikosidani, Toyota-mura, Kamakura-gun. Coll. M. NAKAMURA.
(k) Nagamuma, Toyota-mura, Kamakura-gun. Coll. F. UEDA.
(l) Nisinotani, Hongô-mura, Kamakura-gun. Coll. M. NAKAMURA.
(m) Simo-Miyata, Hatuse-mura, Miura-gun. Coll. K. ASANO.
(n) Okine, Hatuse-mura, Miura-gun. Coll. M. NAKAMURA.
(o) Kami-Miyata, Simoura-mura, Miura-gun. Coll. M. NAKAMURA.

VI). Sizuoka (a) Dainiti, Ukari-mura, Syûti-gun. Coll. R. AOKI.
(b) Asuka, Taruki-mura, Ogasa-gun. Coll. R. AOKI.
(c) Hosoya, Haranotani-mura, Ogasa-gun. Coll. R. AOKI.
(d) Ketienzi, Nangô-mura, Ogasa-guu. Coll. R. AOKI.

VII). Kôti (a) Ioki, Aki-gun. Coll. H. YABE.
(b) Tônohama, Aki-gun. Coll. H. YABE.
(c) One, Aki-gun. Coll. H. YABE.

The geological distribution of the species is lobulated below:

Genera and Species / Localities		*Elphidium crispum*	*Elphidium subgranulosum*	*Elphidium cf. fabum*	*Elphidium advenum*	*Elphidium jenseni*	*Elphidium craticulatum*	*Elphidium yabei*	*Elphidium yezoense*	*Elphidium kusiroense*	*Elphidiella nagaoi*	*Polystomellina discorbinoides*	Geological age
Karahuto (I)	(a)	—	—	—	—	—	—	—	A	—	—	—	Pliocene
	(b)	—	—	—	—	—	—	—	R	—	—	—	〃
	(c)	—	—	—	—	—	—	—	R	—	—	—	〃
Hokkaidô (II)	(a)	—	—	—	—	—	—	—	A	—	—	—	Pliocene
	(b)	C	F	F	R	F	—	—	—	—	R	—	〃
	(c)	C	F	R	R	R	—	—	—	—	—	—	〃
	(d)	F	—	—	—	R	—	R	—	—	C	—	〃
	(e)	R	—	—	—	—	—	—	—	—	—	—	〃
	(f)	R	—	—	—	—	—	C	—	—	R	—	〃
	(g)	R	—	—	—	—	—	F	—	—	—	—	〃
	(h)	R	—	—	—	—	—	—	—	—	R	—	〃
	(i)	—	—	—	—	—	—	—	—	—	R	—	〃
	(j)	—	F	C	F	F	—	—	—	C	—	—	Pleistocene
Aomori, Akita, Niigata, Toyama and Isikawa. (III)	(a)	C	R	R	—	—	—	—	—	—	—	—	Pliocene
	(b)	—	R	R	—	—	—	—	—	—	—	—	〃
	(c)	C	F	—	—	R	—	—	—	—	—	—	〃
	(d)	C	R	R	—	R	—	—	—	—	—	C	〃
	(e)	A	C	R	R	—	—	—	—	—	—	C	〃
	(f)	A	F	R	R	—	—	—	?	—	—	C	〃
	(g)	F	R	—	R	—	—	—	—	—	—	-	〃
	(h)	C	R	R	F	R	—	—	—	—	—	?	〃
	(i)	F	—	R	—	R	—	—	—	—	—	?	〃

Localities		*Elphidium crispum*	*Elphidium subgranulosa*	*Elphidium* cf. *fabum*	*Elphidium advenum*	*Elphidium jenseni*	*Elphidium craticulatum*	*Elphidium yabei*	*Elphidium yezoense*	*Elphidium kusiroense*	*Elphidiella nagaoi*	*Polystomellina discorbinoides*	Geological age
(III)	(j)	F	R	—	C	C	—	—	—	—	—	—	Pleistocene
	(k)	F	R	—	R	—	—	—	—	—	—	—	Pliocene
	(l)	F	—	—	R	—	—	—	—	—	—	—	〃
Tiba (IV)	(a)	—	—	—	F	R	—	—	—	—	—	—	Pleistocene
	(b)	R	—	—	R	R	—	—	—	—	—	—	Pliocene(?)
	(c)	F	R	—	R	—	—	—	—	—	—	—	〃
	(d)	C	R	—	R	—	—	—	—	—	—	—	〃
	(e)	F	R	—	—	R	—	—	—	—	—	—	〃
	(f)	R	—	—	R	R	—	—	—	—	—	—	〃
	(g)	R	—	—	R	—	—	—	—	—	—	—	〃
	(h)	R	—	—	—	—	—	—	—	—	—	—	〃
	(i)	—	—	—	R	—	—	—	—	—	—	—	〃
	(j)	F	R	—	F	R	R	—	—	—	—	—	Holocene
Kanagawa (V)	(a)	F	—	—	R	—	—	—	—	—	—	—	Pliocene(?)
	(b)	R	—	—	—	—	—	—	—	—	—	—	〃
	(c)	F	—	—	R	—	—	—	—	—	—	—	〃
	(d)	F	R	—	R	—	—	—	—	—	—	—	〃
	(e)	F	R	—	R	—	—	—	—	—	—	—	〃
	(f)	R	R	—	R	—	—	—	—	—	—	—	〃
	(g)	C	R	R	R	R	R	—	—	—	—	—	〃
	(h)	R	R	—	R	—	—	—	—	—	—	—	〃
	(i)	F	R	—	R	—	—	—	—	—	—	—	〃
	(j)	—	—	—	R	R	—	—	—	—	—	—	〃
	(k)	F	R	—	C	R	—	—	—	—	—	—	〃
	(l)	R	R	—	R	—	—	—	—	—	—	—	〃
	(m)	F	—	—	F	R	—	—	—	—	—	—	〃
	(n)	R	—	—	R	—	—	—	—	—	—	—	〃
	(o)	F	—	—	R	R	—	—	—	—	—	—	〃
Sizuoka (VI)	(a)	R	—	—	R	—	—	—	—	—	—	—	Pliocene
	(b)	—	R	—	R	—	—	—	—	—	—	—	〃
	(c)	R	—	—	R	—	—	—	—	—	—	—	〃
	(d)	R	—	—	R	—	—	—	—	—	—	—	〃
Kôti (VII)	(a)	R	—	—	R	—	F	—	—	—	—	—	Pliocene
	(b)	F	R	—	R	R	R	—	—	—	—	—	〃
	(c)	F	—	—	—	—	—	—	—	—	—	—	〃

(A····Abundant; C····Ccommon; F····Few; R····Rare)

Before going into the descriptions of the species, the writer wishes to offer his warmest thanks to Prof. H. Yabe of the Institute of Geology and Palaeontology, Tôhoku Imperial University, Sendai, Japan, under whose supervision the present work was carried out, for kind suggestions and corrections of this article before publication; he is also indebted to those who kindly submitted their specimens to him for study.

Family Nonionidae Reuss, 1860

Nonionidea Reuss, Sitz. k. Ak. Wiss. Wien, Math-Naturw., Cl., vol. 40, 1860, p. 221.

Subfamily Elphidinae Galloway, 1933

A Manual of Foraminifera, 1933, p. 269.

Genus *Elphidium* Montfort, 1808

Elphidium Montfort, Conch. Syst., vol. 1, 1808, p. 14; (Genotype, *Nautilus macellus* Fichtel and Moll, in part); Cushman, Contr. Cushman Lab. Foram. Res., vol. 3, pt. 1, 1927, p. 49, pl. 10, fig. 5.

Test free, planispiral, bilaterally symmetrical, mostly involute; chambers numerous with distinct sutures, either depressed or raised and limbate with septal bridges and depressions; wall calcareous, finely perforate; aperture a curved slit or row of pores at base of septal face on inner periphery, or numerous pores on septal face.

The genus first appears in the Middle Jurassic of Russia (Ornatenthon), later it found its best development in the Tertiary, especially of the Vienna or Paris Basin, and became gradually common in succeeding formations up to recent times. It is very abundant in some younger Neogene deposits of Western North America and Japan. Most of the recent species haunt in cold to warm, shallow waters.

Elphidium is the largest genus in the family Nonionidae as to the number of species and individuals. The genus seems to have been evolved from *Nonion* which is the most primitive member of the family, by developing pores along the suture lines. It is sometimes very difficult to distinguish a simple *Elphidium* from *Nonion* owing to the very small size of the septal pores in the former, but higher species of the former are easily distinguished from the latter by their characteristic septal bridges.

Elphidium crispum (Linné)

Pl. 14 (3) figs. 1a, b.

Compare with: Carpenter, W. B., Introduction to the Study of Foraminifera, 1862, p. 278.
Cushman and Leavitt, On *Elphidium macellum* (Fichtel and Moll), *E. striato-punctatum* (Fichtel and Moll) and *E. crispum* (L.), Contr. Cushman Lab. Foram. Res., vol. 5, pt. 1, 1929, pp. 18–22.

The species originally recorded by Linne from the Mediterranean, seem to be widely spread in the Indo-Pacific region. Considerable variations exist in the shape of chamber, umbilicus and septal bridges; and its typical form has a thick biconvex test with sharp periphery. Septal bridges are conspicuously developed and the umbilical region is filled with clear shell material in which there are a few large, rounded pores. The writer has examples from the Miocene of Vienna Basin and the Pliocene of California, as well as numerous specimens from the Indo-Pacific region. It suggests that the Japanese specimens, especially those from the Pliocene of Japan Sea side, are hardly to be distinguished from the Californian form, they are more biconvex and more strongly umbonate than those from the Miocene of Vienna Basin. In spite of these apparent differences, the two types are similar with one another in their essential feature; and it is perhaps better to include both the types to the same species until more is known of their characters and geographical distribution.

Distribution in Japan:

Recent: Japan Sea and Pacific, especially common in the shallow waters of Wakasa, Mutu and Siogama bays and coast of Ondyuku, Tiba prefecture.

Fossil: Pliocene of Setana, Hokkaidô (b, c, d, e, f, g, h); Aomori, Akita, Niigata, Toyama and Isikawa prefectures (a, c, d, e, f, g, h, i, j, k, l); Tiba prefecture (b, c, d, e, f, g, h, j); Kanagawa prefecture (a, b, c, d, e, f, g, h, i, k, l, m, o); Sizuoka prefecture (a, c, d); and Kôti prefecture (a, b, c).

Elphidium subgranulosum n. sp.

Pl. 14(3) figs. 4a, b.

Compare with: *Polystomella striato-punctata* BRADY (not *Nautilus striato-panctata* FICHTEL and MOLL), Rep. Voy. Challenger Zool., vol. 9, 1884, p. 733, pl. 109, fig. 22.

Themeon granulosa GALLOWAY and WISSLER, Jour. Pal., vol. 1, No. 1, 1927, p. 83, pl. 12, figs. 15, 16.

Elphidium hughesi CUSHMAM and GRANT, Trans. San Diego Soc., Nat. Hist. vol. 5, No. 6, 1927, p. 75, pl. 7, fig. 1.

Elphidium decipiens HADA (not COSTA), Sci. Rep. Tohoku Imp. Univ., Ser. 4, 1931, vol. 6, No. 1, p. 126, Text-fig. 83.

Test rather small, bilaterally symmetrical, periphery broadly rounded throughout, very slightly lobulated in last few chambers, diameter about three times thickness; chambers inflated, 8–11 in last whorl, umbilical region slightly depressed, typically with granular material; sutures depressed, slightly curved and each provided with small indistinct, rounded pores; wall fairly thin, finely perforate; aperture a series of small rounded openings at base of opertural face. Diameter 0.3–0.5 mm.; thickness 0.1–0.2 mm.

Holotype (Reg. No. 21418, Institute of Geology and Palaeontology, Tôhoku Imperial University, Sendai, Japan), from the Pliocene of Setana, Hokkaidô.

Up to the present time, this species has been referred by the writer to *E. striato-punctatum* (FICHTEL and MOLL), but it may readily be separated from FICHTEL and MOLL's original (Test. Micr., 1798, p. 61, pl. 9, figs. a–c). Forms more or less similar to the present species have been recorded by the authors enumerated above. *E. hughesi* CUCHMAN and GRANT has sutures of different characters and *E. granulosa* (GALLOWAY and WISSLER) a more granular umbilicus.

There are two varieties in the present form; one is ovate, and similar, in the outline of test, to *E. granulosa* (GALLOWAY and WISSLER), while the other is nearly circular and similar to *E. hughesi* CUSHMAN and GRANT, both forms occur generally in association in the material examined.

Distribution in Japan:

Recent: Shallow to deep waters of Japan Sea and Pacific sides.

Fossil: Pliocene of Setana, Hokkaidô (b, c) and Pleistocene of Kusiro, Hokkaidô (j); Pliocene of Aomori, Akita, Niigata, Toyama and Isikawa (a, b, c, d, e, f, g, h. j, k); Plio-Pleistocene of Tiba (c, d, e) and Early Holocene of Numa (j); Plio-Pleistocene of Kanagawa (d, e, f, g, h, i, k, l); Pliocene of Sizuoka (b) and Kôti prefecture (b).

Elphidium cf. *fabum* (FICHTEL and MOLL)

Pl. 14(3) figs. 7a, b.

Compare with: *Polystomella faba* HERON-ALLEN and EARLAND, Trans. Linn. Soc. vol. 11, 1916, pt. 13, p. 281, pl. 43, figs. 11–19.

Elphidium fabum HADA, Sci. Rep. Tôhoku Imp. Univ., ser. 4, vol. 6, 1931, No. 1, p. 125, text-fig. 82.

HERON-ALLEN and EARLAND state that two distinctive forms are included under FICHTEL and MOLL's species. The first or compressed type, which is nearest to *E. fabum*, has somewhat inflated chambers in involute coils, six or seven visible in the final coil; sutural lines curved and strongly depressed, filled, with fine granular matter radiating from the umbilicus and giving a stellate appearance to the test, owing to the whitish granulations in strong contrast with the hyaline surface of the chambers; septal bridges few in number, are marked by secondary shell-material which becomes visible when wet. The second or turgid type, is much larger, the chambers being less inflated and more numerous, ranging up to 8 or 9 in the final coil; sutural lines depressed, but less so than in the compressed type, and filled with the same granular matter radiating from the depressed umbilicus, but to a lesser degree; septal bridges much more numerous than in the compressed type, and come out strongly when wet, although rarely visible in dry state.

Both forms are present in the collections at the writer's possesion. But accurate identification is impossible without a study of the original specimen.

Distribution in Japan:

Recent: Common in the northern Japan Sea, but very rare in the Pacific coast of Japan.

Fossil: Pliocene of Setana, Hokkaidô (b, c) and Pleistocene of Kusiro, Hokkaidô (j); Pliocene of Aomori, Akita, Niigata, Toyama, and Isikawa prefoctures (a, d, e, f, h, i); Plio-Pleistocene of Kanagawa prefecture (g).

Elphidium advenum (CUSHMAN)

Pl. 14(3) figs. 3a, b.

1884. *Polystomella subnodosa* BRADY (not MÜNSTER), Rep. Voy. Challenger Zool. vol. 9, p. 734, pl. 110, fig. 1.
1904. *Polystomella subnodosa* MILLETT, Jour. Roy. Micr. Soc. pt. 16, p. 604.
1922. *Polystomella advena* CUSHMAN, Carnegie Inst. Washington, Publ. 311, p. 56, pl. 9, figs. 11, 12.
1924. *Polystomella advena* CUSHMAN, Ibid., Publ. 342, p. 48.
1928 *Polystomella advena* CUSHMAN, Ibid., Publ. 344, p. 80.
1930. *Elphidium advenum* CUSHMAN, U. S. Nat. Mus., Bull. 104, pt. 7, p. 25. pl. 10, figs. 1, 2.
1930. *Elphidium advenum* CUSHMAN, Florida St. Geol. Surv., Bull. 7. p. 40, pl. 7, fig. 7.
1933. *Elphidium advenum* CUSHMAN, U. S. Nat. Mus., Bull. 161, pt. 2, p. 50, pl. 12, figs. 1–3.

According to CUSHMAN, MÜNSTER's *Robulina subnodosa* has a rhomboid test in apertural view, with the greatest width at the umbilicus. But the specimens referred by BRADY and MILLETT to MÜNSTER's species are very far from the type; these may be assigned to CUSHMAN's *advenum*.

CUSHMAN describes this as follows:

"Test equally biconvex, periphery acute, often with a narrow keel, and in the last formed portion somewhat lobulate in side view, umbilical region usually with a small boss; chambers numerous, somewhat inflated, especially in the last-formed portion; sutures depressed, the retral processes in the later portion only about one-fourth the width of the chamber, in depressed channels above the sutures, the intermediate portions raised; wall smooth, translucent, very finely perforate; aperture a series of rounded pores, at the base of the apertural face of the chamber."

Our specimen figured is quite identical with Cushman's species from the Pacific.

Distribution in Japan:

Recent: Common in the shallow waters of the Pacific side of Japan, but rare in Japan Sea.

Fossil: Pliocene of Setana, Hokkaidô (b, c) and Pleistocene of Kusiro, Hokkaidô (j); Pliocene of Niigata, Toyama and Isikawa prefectures (e, f, g, h, j, l) and Pleistocene of Hiradoko, Isikawa prefecture (k); Plio-Pleistocene of Tiba prefecture (a, b, c, d, f, g, i, j); Plio-Pleistocene of Kanagawa prefecture (a, c, d, e, f, g, h, i, j, k, l, m, n, o); Pliocene of Sizuoka prefecture (a, b, c, d) and Aki-gun, Kôti prefecture (a, b).

Elphidium jenseni (Cushman)

Pl. 14(3) figs. 5a, b.

1904. *Polystomella macella* (F. and M.) var. Jensen, Proc. Linn. Soc., vol. 29, p. 817, pl. 23, fig. 4.
1924. *Polystomella jenseni* Cushmam, Carnegie Inst. Washington, Publ. 342, p. 49, pl. 16, fig. 6.
1933. *Elphidium jenseni* Cushman, U. S. Nat. Mus., Bull. 161 pt. 2, p. 48, pl. 11, figs. 6, 7.

Jensen originally described this species under the name *macella* from off the coast of Australia in 100 fathoms. Its distribution is in shallow seas of the Indo-Pacific. The writer previously recorded this form likewise under the name of *E. macellum* (Fichtel and Moll), but the typical *macellum* has a more convex and completely involute test. The Japanese material may be described as follows:

Test much compressed, periphery slightly keeled, sometimes lobulated; chambers numerous, not inflated, later tending to uncoil; sutures distinct, slightly raised, septal bridges almost entirely occupying area between sutures; umbilical region finely papillate. Diameter up to 0.6 mm.; thickness ca 0.15 mm.

Distribution in Japan:

Recent: Shallow waters of the Pacific side and Western Japan Sea.

Fossil: Pliocene of Setana, Hokkaidô (b, c, d) and Pleistocene of Kusiro, Hokkaidô (j); Pliocene of Niigata and Isikawa prefectures (c, d, h, i) and Pleistocene of Hirakoko, Isikawa prefecture (j); Plio-Pleistocene of Tiba prefecture (a, b, e, f, j); Plio-Pleistocene of Kanagawa prefecture (g, j, k, m, o); and Pliocene of Kôti (b).

Elphidium craticulatum (Fichtel and Moll)

Pl. 14(3) figs. 6a, b.

1862. *Polystomella craticulata* Carpenter, Intr. Foram., p. 279, pl. 16, figs. 1, 2.
1884. *Polystomella craticulata* Brady, Rep. Voy. Challenger Zool., vol. 9, p. 739, pl. 110, figs. 17, 16.
1893. *Polystomella craticulata* Egger, Abh. Kün, bay, Akad. Wiss., Cl. 2, vol. 18, p. 433, pl. 20, figs. 24, 25.

1914. *Polystomella craticulata* CUSHMAN, U. S. Nat. Mus., Bull. 71, pt. 4, p. 43, pl. 19, fig. 4.
1933. *Elphidium craticulatum* CUSHMAN, Ibid., Bull. 161, pt. 2, p. 48, pl. 11, figs. 5a, b.

Test subglobose, composed of more than 20 chambers in last formed coil, broadly lenticular in spertural face, periphery entire, not keeled; umbilical area filled with clear shell material with numerous pores, but not distinctly raised, rest of surface reticulate; aperture distinct, at base of apertural face. Diameter up to 1.5 mm.; thickness ca. 0.5 mm.

The specimen from the Pliocene of Kamakura, Kanagawa prefecture, here figured is not typical; those from the Byôritu Beds, Taiwan are composed of as may as 50 chambers in the last coil. This species is a typically shallow water form of the Indo-Pacific.

Distribution in Japan:

Recent: Only known from the coast of Kyûsyû and Sikoku.

Fossil: Early Holocene of Numa, Tiba prefecture; Plio-Pleistocene of Kanagawa prefecture (g) and Pliocene of Kôti prefecture (a, b).

Elphidium yabei n. sp.

Pl. 14(3) figs. 9a, b; 10a, b.

Test nearly circular in side view, periphery broadly rounded, lobulated, umbilical region somewhat depressed, occupied by a large flat boss; chambers numerous, 11 or 12 in last coil, of rather uniform shape, later ones slightly inflated; sutures distinct, depressed and curved; septal pores often indistinct, very small; aperture in early stages represented by numerous pores at base of apertural face, in adult by many rounded pores in terminal face of the last chamber. Diameter up to 1.5 mm.; thickness ca. 0.5 mm.

Holotype (Reg. No. 21419) from the Pliocene of Setana, Hokkaidô.

E. simplex CUSHMAN which is abundant in the Indo-Pacific region somewhat resembles the present fossil, but may easily be distinguished by the different characters of aperture.

Distribution in Japan:

Recent: unknown.

Fossil: Pliocene of Setana, Hokkaidô (d, f, g).

Elphidium yezoense ASANO

Pl. 14(3) fig 11.

1937. *Elphidium yezoense* ASANO, Trans. Pal. Soc. Japan, No. 44, p. 120, pl. 24, figs. 1, 2; text figs. 1, 2.

Test comparatively large, compressed, diameter about 4 times thickness, periphery rounded, usually lobulated, umbilical region strongly umbonate, much raised with a large boss of clear shell material, chambers as many as 20 in last formed coil; later chambers slightly inflated with wavy periphery, earlier ones not inflated and entire along periphery; sutures gently curved, depressed, retral processes numerous and short, somewhat indistinct in earlier ones; wall thick; aperture consisting of a low broad openings at base of apertural face; occasionally with circular pores on central portion of apertural face. Length up to 2.5 mm.; breadth ca. 0.6 mm.

Holotype (Reg. No. 21433) from the Pliocene of Takikawa, Hokkaidô.

This species is allied to *E. oregonense* CUSHMAN and GRANT, but is distinguishable by the different character of umbonal region. It is apparently variable in number and shape of chambers. The species is very common in the Pliocene of Takikawa, Hokkaidô and Karagai, Karahuto, in both cases found solely without association of any other species of foraminifera; it is also noteworthy that it occurs always in association with *Pecten takahashii* Yokoyama, a characteristic Pliocene Mollusca of Japan.

Distribution in Japan:

Recent: unknown.

Fossil: Pliocene of Takikawa beds, Hokkaidô (a), Zintaki beds, Karahuto (a), and Maruyama sandy shale, Karahuto (b, c).

Elphidium kusiroense n. sp.

Pl. 14(3) fig. 2.

Test rather small, compressed, periphery rounded, not keeled; umbilical region depressed, without a definite boss; chambers distinct, very slightly inflated, usually 9 to 11 in number; sutures slightly depressed, septal processes very distinct, but occupying only a narrow band above sutures; wall translucent, very finely perforate; aperture consisting of one or more openings at base of apertural face. Diameter 0.3–0.4 mm.; thickness 0.1–0.15 mm.

Holotype (Reg. No. 21420) from the Pleistocene of Harutori, Kusiro City, Hokkaidô.

This is a small species, but hardly to be confused with any other in the region.

Distribution in Japan:

Recent: Northern Japan.

Fossil: Pleistocene of Kusiro, Hokkaidô.

Genus *Elphidiella* Cushman, 1936

Elphidiella Cushman, Contr. Cushman Lab. Foram. Res., vol. 12, pt. 4, 1936, p. 89.

The genus is distinguishable from *Elphidium* by two rows of openings along the sutures. The species of this genus are generally arctic and reach fairly large size; they are:

- *E. arctica* (Parker and Jones)
- *E. hannai* (Cushman and Grant)
- *E. nagaoi* n. sp.
- *E. sibirica* (Goës)
- *E. groenlandica* (Cushman)

Elphidiella nagaoi n. sp.

Pl. 14(3) figs. 8a, b.

Test composed of about 10 chambers in last formed coil, in face view about 3 times as long as wide, periphery broadly rounded, umbilical area slightly depressed, papillate; chambers somewhat inflated; septal lines with openings in two rows, but irregularly arranged in earlier ones; aperture divided into a number of small openings at base of apertural face. Diameter up to 2 mm.

Holotype (Reg. No. 21421) from the Pliocene of Setana, Hokkaidô.

This large and striking species is unlike any of the others recorded. The species is usually found in association with extinct forms, such as *Elphidium yabei* n. sp., *Cassidulina yabei* Asano and Nakamura, and *Cassidulina setanaensis*

Asano and Nakamura.

Distribution in Japan:
Recent: unknown.
Fossil: Pliocene of Setana, Hokkaidô. (b, d, f, h, i).

Genus *Polystomellina* Yabe and Hanzawa, 1923

Polystomella (*Polystomellina*) *discorbinoides* Yabe and Hanzawa, Jap. Jour. Geol. Geogr., vol. 2, 1923, p. 95

Test similar to *Elphidium* in general structure but trochoid, plano-convex, ventral side flattened, dorsal side convex.

The members of this genus are now known from the Natukawa beds of the oil-bearing Neogene Tertiary of Etigo, Japan and from the Miocene of Filter Quarries, Batesford, Victoria, Australia (*P. miocenica* Cushman), and from 10 fathoms, Van Diemans Inlet, Gulf of Carpentaria, Queensland, Australia (*P. australis* Cushman).

Polystomellina discorbinoides Yabe and Hanzawa

1923. *Polystomellina discorbinoides* Yabe and Hanzawa, Jap. Jour. Geol. Geogr., vol. 2, p. 95, text-figs. a–c.

Foraminifera are very common in the Natukawa beds, Etigo, Japan and the present species is very common and distinct from others. Living representative unknown.

日本産 *Elphidium* 屬有孔蟲（摘要）

淺野清

從來日本産 *Elphidium* 屬の有孔蟲に關しては，主として Brady の "Challenger Foraminifera" に基いて研究されてゐたが，其後の調査に依り，改革しなくてはならぬやうになつた。現在本屬及その近似屬のものに11種が有效と認められる。其等のものに就いての Synonym, geological 及び geographical distribution を取扱つたものである。之等のうちで，特に *Elphidium yabei*, *E. yezoense*, *Elphidiella nagaoi*, *Polystomellina discorbinoides* は，東北日本・北海道・樺太の鮮新世のみに産し，且つ何れも絶滅種であることは，地質學上注目すべき種と考へられる。

65. On the Japanese Species of Nonion and Its Allied Genera.

By

Kiyosi Asano

(Contribution from the Institute of Geology and Palaeontology, Tôhoku Imperial Uuiversity, Sendai, Japan : Read December 18th; received December 20th, 1937.)

A preliminary study of the Japanese species referable to the four genera, *Nonion, Nonionella, Pseudononion* and *Astrononion* was undertaken and the results obtained are here given as the basis for farther research.

Family Nonionidae Reuss, 1860
Subfamily Nonioninae Schultze, 1854
Genus *NONION* Montfort, 1808

Nonion Montfort, Conch. Syst., vol. 1, 1808, p. 210. (Genotype, *Nonion incrassatus* (Fichtel and Moll); Cushman, Special Publ., No. 1, Cushman, Lab. Foram. Res., 1928, p. 204.

Test free, planispiral, bilaterally symmetrical, periphery broadly rounded to acute; chambers numerous, closely appressed; wall calcareous, hyaline, finely perforate, smooth, sometimes with umbilical thickening; aperture, an arched, narrow opening at base of apertural face on inner periphery.

The genus *Nonion* is the most primitive member of the family Nonionidae with the earliest appearance in the Jurassic. The fossils of *Nonion* and its allied genera found in the Neogene rocks of Japan mostly belong to recent species, but there are several unrecorded ones from the seas surrounding our country. There are 9 species of *Nonion* in Japan, namely, *N. japonicum* n. sp., *N. manpukujiense* Ôtuka, *N. boueanum* (d'Orbigny) var., *N. scaphum* (Fichtel and Moll), *N. subturgidum* (Cushman), *N. grateloupi* (d'Orbigny), *N. pompilioides* (Fichtel and Moll), *N. pompiliodes etigoense* n. subsp., and *N.* cf *umbilicatulum* (Montagu). Of these forms, *N. manpukujiense* Otuka and *N. pompilioides etigoense* n. subsp. are known only as fossil. The former seems in its distribution to be confined to the Plio-Pleistocene of the Pacific side of Japan, and the latter is always found in association with *Polystomellina discorbinoides* Yabe and Hanzawa, a characteristic Pliocene Foraminifera of Etigo, Japan. *N. pompilioides* (Fichtel and Moll) is fairly common in the Poliocene of Kakegawa, Tôtômi and Aki-gun, Tosa, but apparently absent in the Japan Sea side, both fossil and recent. Other forms are well adapted to have a geographic range as those of *Elphidium.* Compared to *Elphidium, Nonion* and its allied genera are, as a rule, more abundant in slightly deeper water of the present seas.

Nonion japonicum n. sp.

Pl. 15(4) figs. 1a, b; 2a, b.

Test oval, bilaterally symmetrical, composed of 10–13 chambers in last formed coil; umbilical region covered with a granular shell matrial, from which curved, limbate sutures radiate; periphery acute but not keeled; surface smooth, very finely perforate; aperture forming a narrow curved slit at basal margin of apertural face. Length up to 1 mm.; thickness ca. 0.4 mm.

Holotype (Reg. No. 21422, Institute of Geology and Palaeontology, Tôhoku Imperial University) from the Pliocene of Muraoka-mura, Kamakura-gun, Kanagawa prefecture.

This new form is one of the best known of the Plio-Pleistocene Foraminifera of Japan, and has hitherto been treated by the writer as *N. boueanum* (d'ORBIGNY); but it may better be separated by much granular umbo and almost entire margin of test, since d'ORBIGNY's original figure represents a specimen with a compressed test, sharp lobulated in peripheral margin (Foram. Foss. Vien., 1864, p. 108, pl. 5, figs. 11, 12). CUSHMAN treats *N. boueanum* (d'ORBIGNY) as synonymous with *N. asterizans* (FICHTEL and MOLL) (U. S. Nat. Mus., Bull. 104, pt. 7, 1930, p. 6, pl. 2, figs. 5–7).

Distribution in Japan:

Recent: Common in the Pacific side and rare in the Japan Sea side.

Fossil: Pleistocene of Kusiro, Hokkaidô; Pliocene of Sawane, Sado Island, and Simotaka-mati, Kariha-gun, Niigata prefecture; Atuki, Totuka-mati, and Ôkine, Hatuse-mura, Kanagawa prefecture; Sanuki-mati, Ônuki-mati, and Tosaki, Tiba prefecture; Asuka and Kamiyasiki, Taruki-mura, Hosoya, Haranotani-mura, Sugiya and Ketienzi, Nangô-mura, Sizuoka prefecture; Ioki, Tônohama and Ôno, Aki-gun, Kôti prefecture.

Nonion manpukujiense OTUKA

Pl. 15(4) figs. 3, 8.

1932. *Nonion manpukujiensis* OTUKA, Jour. Geol. Soc. Tôkyô, vol. 39, No. 469, p. 654 (in Japanese).

The present form originally dealt with by Y. OTUKA as a distinct species differs from *N. japonicum* only by having fine striae which obliquely cross sutures near umbilical region.

Distribution in Japan:

Recent: unknown.

Fossil: Plio-Pleistocene of Naganuma, Toyota-mura, Utikosidani and Nisinotani, Hongô-mura; Yazu and Nozima, Kanazawa-mati, and Takaya, Muraoka-mura, all in Kanagawa prefecture; Hosoya, Haranotani-mura and Sugiya Nangô-mura, Sizuoka prefecture; Ioki, Tônohama and Ono, Aki-gun, Kôti prefecture.

Nonion scaphum (FICHTEL and MOLL)

Pl. 15(4) figs. 4a, b.

Compare with: 1884. *Nonionina scapha* BRADY, Rep. Challenger Zool., vol. 9, p. 730, pl. 109, figs. 14–16.

1930. *Nonion scaphum* CUSHMAN, U. S. Nat. Mus., Bull. 104, pt. 7, p. 5, pl. 2, figs. 3, 4.

Test planispiral, bilaterally symmetrical, not completely involute, composed of about 10 chambers in last formed coil, periphery broadly rounded; umbilical region depressed, not ornamented; later chambers much inflated, broadening rapidly; sutures distinct, depressed, not limbate; wall smooth, finely perforate; aperture narrow at base of apertural face.

CUSHMAN treats *Nonion communis* (d'ORBIGNY) (For. Foss. Vien., 1864, p. 108, pl. 5, figs. 7, 8) as synonymous with *N. scaphum*; REUSS, on the other hand, assigns the former to *N. boueanum* (Sitz. d. k. Ak. Wiss. Wien, 1864, vol. 1, p. 479, No. 5), but BRADY states that *Nonion communis* forms an intermediate link almost equally related to both varieties. Farther, CUSHMAN takes "*Nautilus faba*" of FICHTEL and MOLL (Test. Micr., 1798, p. 103, pl. 19, figs. a–c) as a synonym of *N. scaphum*, while HERON-ALLEN and EARLAND say, "FICHTEL and MOLL's description of *faba* indicates a pauperate form intermediate between *Nonion* and *Elphidium*, but referable to the latter genus on account of its retral processes." (Trans. Linn. Soc. London, vol. 11, pt. 13, 1916, p. 281).

Distribution in Japan:

Recent: Common in the northern Japan Sea, but rare in the Pacific side of Japan.

Fossil: Pliocene of Turihasi, and Pirika-eki, Tosibetu-mura, Setana-gun, Hokkaidô; Pliocene of Wakimoto, Oga Peninsula, Akita prefecture; Simotaka-mati, Kariha-gun, Niigata prefecture; Hôrakuzi, Konade-mura. Nisitonami-gun, Toyama prefecture; Plio-Pleistocene of Sanuki-mati, Kimitu-gun and Moroiti, Sittu-gun, Tiba prefecture; Plio-Pleistocene of Tomioka, Kanazawa-mati, Kuraki-gun, and Muraoka-mura, Kamakura-gun, Kanagawa prefecture; Farly Holocene of Numa, Awa-gun, Tiba prefecture.

Nonion subturgidum (CUSHMAN)

Pl. 15(4) figs. 6a, b.

1924. *Nonionina subturgida* CUSHMAN, Carnegie Inst. Washington, Publ. 342, p. 47, pl. 16, fig. 2.
1933. *Nonion subturgidum* CUSHMAN, U. S. Nat. Mus., Bull. 161, pt. 2, p. 43, pl. 10, figs. 4–7.

Test bilaterally symmetrical, composed of 8–9 chambers, increasing in length as added, in last-formed coil; periphery rounded, somewhat edged in earlier chambers; suture distinct, nearly straight, very slightly depressed; apertural face rounded triangular, aperture narrow, at base of last-formed chamber.

This species differs from *N. japonicum* by less number of chambers and absence of secondary materials at the umbilicus.

Distribution in Japan:

Recent: Pacific side of Japan.

Fossil: Pliocene of Wakimoto, Oga Peninsula, Akita prefecture; Pliocene of Natukawadani, Kitadyô-mura, Kariha-gun, Niigata prefcture; Plio-Pleistocene of Sanuki-mati, and Ititoku, Koito-mura, both in Kimitu-gun, Tiba prefecture; and of Muraoka-mura, Kamakura-gun, Kanagawa prefecture; Pliocene of Hosoya Horanotani-mura, Ogasa-gun, Sizuoka prefecture.

Nonion grateloupi (d'ORBIGNY)

Pl. 15(4) fig. 14.

Compare with: 1930. *Nonion grateloupi* CUSHMAN, U. S. Nat. Mus., Bull. 104, pt. 7, p. 10, pl. 3, figs. 9–11; pl. 4, figs. 1–4.

1933. *Nonion grateloupi* CUSHMAN, Ibid., Bull. 161 pt. 2, p. 43, pl. 10, figs. 8a–c.

Test small somewhat elongate, oval, planispiral, nearly parallel-sided, rounded at periphery; chambers numerous, usually 10–12 in last formed coil, chambers increasing rapidly in length, especially in last few chambers; sutures distinct, slightly depressed; wall smooth, finely perforate; aperture small at base of apertural face.

Several specimens are found in the Plio-Pleistocene materials from Bôsô and Miura Peninsulas.

Distribution in Japan:

Recent: Pacific.

Fossil: Pliocene of Simotaka-mati, Kariha-gun, Niigata prefecture; Plio-Pleistocene of Mandano, Makita-mura, Kimitu-gun, Tiba prefecture; and of Utikosidani, Hôngô-mura, and Takaya, Muraoka-mura, both in Kamakura-gun, Kanagawa prefecture.

Nonion boueanum (d'ORBIGNY) var.

Pl. 15(4) figs. 5a, b.

Compare with: 1864. *Nonionina boueana* d'ORBIGNY, For. Foss. Vien., p. 108, pl. 5, figs. 11, 12.

The present form is much compressed and nearly circular in side view, but the peripheral margin of chambers is not so acute as in *N. boueanum*.

Distribution in Japan.

Recent: unknown.

Fossil: Pliocene of Kaigarazawa, Kuromatunai-mura, Suttu-gun, Hokkaidô. Plio-Pleistocene of Muraoka-mura, Kamakura-gun, Kanagawa prefecture.

Nonion cf. *umbilicatulum* (MONTAGU)

Pl. 15(4) figs. 7a, b.

Compare with: 1884. *Nonionina umbilicatula* BRADY, Rep. Voy. Challenger Zool., vol. 9, p. 726, pl. 109, figs. 8, 9.

BRADY says, "*N. umbilicatula* forms a good quasi-specific type, embodying characters about midway between those of *N. depressula* (WALKER and JACOB) and *N. pompilioides* (FICHTEL and MOLL). From the former it is distinguished by its more compact built and deeply sunk umbilici, from the latter by its relatively depressed contour and larger number of chambers."

HERON-ALLEN and EARLAND state, "There is a certain amount of variation due (1) to the degree of turgidity in the growth of shell, and (2) to the degree of envelopment of the chambers of the final whorl. In young specimens there is no depression at the umbilicus. With increase in size if the shell continues of the non-turgid type, the whorls are almost entirely embracing, so that the umbilical region remains either almost flush or very slightly depressed. If the chambers are of the turgid type approaching *N. pompilioides* (FICHTEL and MOLL), each successive convolution becomes less enveloping, so that the umbilicus becomes deep." (Trans. Linn. Soc. London, vol. 11, pt. 13; 1916, p. 297).

If the above noted statements are accepted, this species is a cosmopolitan form, ranging from Smith Sound, about lat. 80°N., to the south of Patagonia, about lat. 51°S. The bathymetrical range extends from 30 or 40 fathoms down to 3125 fathoms.

Distribution in Japan:

Recent: Rare in Japan Sea and Pacific.

Fossil: Pliocene of Sawane, Sado Island, Niigata prefecture; Plio-Pleistocene of Sanuki-mati, Kimitu-gun, Tiba prefecture, Muraoka-mura, Kamakura-guu, Kanagawa prefecture; Pliocene of Hosoya, Haranotani-mura, Ogasa-gun, Sizuoka prefecture.

Nonion pompilioides (FICHTEL and MOLL)

Pl. 15(4) figs. 13a, b.

Compare with: 1933. *Nonion pompilioides* CUSHMAN, U. S. Nat. Mus., Bull. 161, pt. 2, p. 41, pl 10, figs. 1, 2.

The present form originally described by FICHTEL and MOLL on recent specimens of the Mediterranean and Pliocene one of Coronica, Italy, seems to be an essentially deep-water species. Our specimens, both fossil and recent, are quite similar to those from the Albatross stations recorded by J. A. CUSHMAN. He describes this species as follows:

"Test planispiral, bilaterally symmetrical, entirely involute, except that the umbilici are deeply excavated, periphery very broadly rounded, entire; chambers 8 to 10 in the last-formed coil of the same general shape, not inflated; sutures flush with the surface, generally limbate, fusing along the umbilicus to form a slight thickening about it but not raised above the surface; wall smooth, coarsely perforate; aperture slit-like, between the base of the apertural face and the previous coil, apertural face broad and low."

This species differs from *N. umbilicatulum* by much thicker test and rather fewer chambers of the last formed coil.

Distribution in Japan:

Recent: Pacific.

Fossil: Pliocene of Asuka, and Kamiyasiki, Taruki-mura, Ogasa-gun, Sizuoka prefecture; Pliocene of Tônohama and Ôno, Aki-gun, Kôti prefecture.

Nonion pompilioides etigoense n. subsp.

Pl. 15(4) figs. 10a, b.

This form differs from the typical one with less number of inflated chambers and nearly straight sutures; it is known only from the Pliocene of Etigo, where it is found always in association with *Polystomellina discorbinoides* YABE and HANZAWA, and *Cassidulina yabei* ASANO and NAKAMURA, two characteristic Pliocene Foraminifera of Japan.

Holotype (Reg. No. 21423, Institute of Geology and Palaeontology, Tôhoku Imperial University), from the Pliocene of Natukawadani, Kitadyô-mura, Kariha-gun, Niigata prefecture, Japan.

Genus *Pseudononion* ASANO, 1936

Pseudononion ASANO, Trans. Pal. Soc., Japan, 1936, No. 15, p. 347.

Nonionella (Part) CUSHMAN, Contr. Cushman Lab. Foram. Res., vol. 2, 1926, p. 64.

Test free, bilaterally asymmetrical, dorsal side partially involute, leaving previous whorls uncovered, ventral side completely involute, having no elongate lobe at umbilicus; chambers numerous, earlier ones only visible on one side of test; wall calcareous, finely perforate; aperture a narrow slit at base of apertural face.

This genus was derived from a planispirally involute form, probably *Nonion*, by an asymmetrical arrangement of the later chambers; already in *Nonionella*, a distinct, elongate lobe is developed at the umbilicus on the ventral side of the test. It is now represented in Japan by two species, *P. japonicum* ASANO and *P. tredecum* ASANO which are common in the late Tertiary and recent material of Japan.

Pseudononion japonicum ASANO

Pl. 15(4) figs. 11a–c.

1936. *Pseudononion japonicum* ASANO, Trans. Pal. Soc. Japan, No. 15, p. 347, Text-figs. a–c.

Test asymmetrical, depressed, dorsal side slightly convex with all coils visible, ventral side with only last-formed coil visible, periphery subacute; chambers distinct, 10–12 in adult, having no elongate lobe extending over umbilicus on ventral side; sutures distinct, slightly depressed, gently curved; wall finely perforate; aperture a narrow slit at base of apertural face.

Distribution in Japan:

Recent: Few in the Japan Sea and rare in the Pacific.

Fossil: Pliocene of Kaigarazawa and Nakanosawa, Kuromatunai-mura, Suttu-gun, Hokkaidô; Pleistocene of Kusiro, Hokkaidô; Pliocene of Wakimoto, Oga Peninsula, Akita prefecture; Plio-Pleistocene of Sanuki-mati, Kimitu-gun, and Ônuki-mati, Kimitu-gun, Tiba prefecture; Plio-Pleistocene of Ôkine, Hatuse-mura, Miura-gun, and Takaya, Muraoka-mura, Kamakura-gun, Kanagawa prefecture; Pliocene of Ioki and Ôno, Aki-gun, Kôti prefecture.

Pseudononion tredecum ASANO

1936. *Pseudononion tredecum* ASANO, Journ. Geol. Soc. Japan, vol. 43, No. 515, p. 622, pl. 33, figs. 7a–c.

Test depressed, bilaterally asymmetrical, ventral side completely involute, dorsal side somewhat evolute, periphery subacute, umbilicus of ventral side distinct, filled with granular shell-substance; chambers numerous, usually 13–14 in last formed coil in adult; sutures distinct, slightly depressed: wall smooth, finely perforate; aperture small, at base of last chamber.

This species, originally described by the writer from the Pliocene of Setana, Hokkaidô, differs from *P. japonicum* by nearly circular test with more chambers.

Distribution in Japan:

Recent: Rare in Japan Sea and Pacific.

Fossil: Pliocene of Kaigarazawa and Nakanosawa, Kuromatunai-mura, Suttu-gun, Hokkaidô; Plio-Pleistocene of Sanuki-mati, Kimitu-gun, Tiba prefecture.

Genus *Nonionella* CUSHMAN, 1926

Nonionella CUSHMAN, Contr. Cushman Lab. Foram. Res., vol. 2, 1926, p. 64.

"Test subtrochoid, the dorsal side only partially involute, ventral side completely so, close coiled; chambers especially in the adult inequilateral, the ventral side developing a distinct elongate lobe at the umbilical end, which covers the umbilicus itself; wall calacareous, finely perforate; aperture at the apertural face of the chamber, low and elongate, extending from the peripheral border toward the ventral side." (CUSHMAN)

Nonionella pulchella HADA

Pl. 15(4) figs. 12a, b.

1931. *Nonionella pulchella* HADA,' Sci. Rep. Tôhoku Imp. Univ., Sendai, Japan, 4th ser., vol. 6, No. 1, p. 120, Text-fig. 79.

Test oval, somewhat compressed, composed of about two convolutions, peripheral margin rounded; chambers narrow, curved, increasing rapidly in size as added, all chambers in outer coil visible, umbilical end of last chamber growing in a peculiar manner to cover umbilicus in ventral side; sutures distinct, depressed slightly; wall smooth, somewhat translucent or opaque, finely perforate; aperture forming a narrow, arched slit.

This species is distinguishable from *N. miocenica* CUSHMAN by the margin of the umbilical lobe of chamber, having five distinct lobelets or crenations.

Distribution in Japan:

Recent: Common in Japan Sea and North-Eastern Pacific side of Japan.

Fossil: Pliocene of Kaigarazawa and Nakanosawa, Suttu-gun, Hokkaidô; Pliocene of Utimanbe-gawa, Okunai-mura, Higasi-Tugaru-gun, Aomori prefecture; Plio-Pleistocene of Mandano, Makita-mura, Kimitu-gun, Tiba prefecture; Plio-Pleistocene of Ôkine, Hatuse-mura, Miura-gun, and Takaya, Muraoka-mura, Kamakura-gun, Kanagawa prefecture.

Genus. *Astrononion* CUSHMAN and *Edwards*, 1937

Astrononion CUSHMAN and EDWARDS, Contr. Cushman, Lab. Foram. Res., vol. 13, pt. 1, 1937, p. 30.
Nonionina and *Nonion* (part) of authors.

"Test free, planispiral, coiled, bilaterally symmetrical or nearly so, periphery broadly rounded; chambers numerous, distinct, usually somewhat inflated, with supplementary tubular or rhomboid chambers on both sides, alternating with the primary chambers, wall calcareous at the base of the last formed chamber in the median line, a low arched opening, which in some species may be somewhat subdivided, the supplementary chambers with either rounded openings at the peripheral end, or, in those species with distinctly rhomboid supplementary chambers, with the aperture elongate along the peripheral posterior margin." (CUSHMAN and EDWARDS).

Astrononion stelligerum (d'ORBIGNY)

Pl. 15(4) figs. 9a, b.

Compare with: 1937. *Astrononion stelligerum* CUSHMAN and EDWARDS, Contr. Cushman, Lab. Foram. Res., vol. 13, pt. 1, p. 31, figs. 7a, b.

This is a species comparatively small in size, and hardly to be confused with any other.

Distribution in Japan:

Recent: Rare in Japan Sea and Pacific.

Fossil: Plio-Pleistocene of Takaya, Muraoka-mura, Kamakura-gun, Kanagawa prefecture; Pliocene of Natukawadani, Kitadyô-mura, Kariha-gun, Niigata prefecture.

Summary

Of the 12 forms described, 2 are known only as fossil, namely, *Nonion manpukujiense* OTUKA and *N. pompilioides etigoense* n. subsp. Of the other 10 forms, *N. pompilioides* (FICHTEL and MOLL) and *N. subturgidum* (CUSHMAN) are inhabitants of the warm waters southward from Japan at the present time, while *N. scaphum* (FICHTEL and MOLL), *N. grateloupi* (d'ORBIGNY), *N.* cf. *umbilicatulum* (MONTAGU) and *Astrononion stelligerum* (d'ORBIGNY) have a world wide distribution, both fossil and recent. *N. japonicum* n. sp. occurs commonly in the surrounding waters of Japan, as well in its Plio-Pleistocene materials.

Among the fossil forms, it is noteworthy that *N. pompilioides etigoense* n. subsp. is always found in association with *Polystomellina discorbinoides* YABE and HANZAWA and *Cassidulina yabei* ASANO and NAKAMURA, which are two characteristic Pliocene Foraminifera of Japan. *N. manpukujiense* OTUKA is common in the Plio-Pleistocene of Tiba, Kanagawa, Sizuoka and Kôti prefectures.

Finally I wish to offer my warmest thanks to Prof. H. YABE of the Institute of Geology and Palaeontology, Tôhoku Imperial University, Sendai, Japan, under whose direction I am studying the Neogene Foraminifera faunas of Japan, for kindly correcting and reconstructing this note before publication.

日本產 *Nonion* 屬有孔蟲（摘要）

淺野清

從來日本產 *Nonion* 屬の有孔蟲に關しては，僅か數種のみしか知られて居なかつたが，今回，現生種，化石種を合せて 12 種を認めることが出來た。うち 2 種卽ち *N. manpukujiense,* 及 *N. pompilioides etigoense* は化石のみしか知られてゐない。其他の 10 種は何れも現在まで生きてゐるものであり，*N. subturgidum* 及 *N. pompilioides* の 2 種は，日本の南に多く，日本海には未だ發見されない。其外のものは，現世，化石共に，分布極めて廣く，殆ど cosmopolitan である。本文には，之等の種の日本に於ける分布と種の Synonym に關する考察を行つたものである。

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66. On the Japanese Species of *Bolivina* and Its Allied Genera

By

Kiyosi Asano

(Contribution from the Institute of Geology and Palaeontology, Tôhoku Imperial University, Sendai, Japan: Received January 18th; read February 12th, 1938)

Of many different species of *Bolivina* and its allied genera distinguished up to the present time from the Japanese material, valid are the following species, namely:

1. *Bolivina hantkeniana* Brady
2. *B. robusta* Brady
3. *B. seminuda* Cushman
4. *B. hanzawai* Asano
5. *B. subangularis ogasaensis* Asano
6. *B. bradyi* n. sp.
7. *B. pseudodifformis* n. sp.
8. *B. aenariensis* (Costa)
9. *B. alata* (Seguenza)
10. *B. spinescens* Cushman
11. *Bolivina striatula* Cushmam
12. *Loxostoma karrerianum* (Brady)
13. *L. amygdalaeforme* (Brady)
14. *Loxostoma amygdalaeforme iokiense* n. subsp.
15. *Bifarina japonica* n. sp.
16. *Rectobolivina bifrons* (Brady)
17. *Bolivinita quadrilatera* (Schwager)
18. *B. quadrilatera cuneata* n. subsp.
19. *Bolivinella folium* (Parker and Jones)
20. *Geminaricta pacifica* n. sp.

In the present paper these forms in the collection of the Institute of Geology and Palaeontology, Tôhoku Imperial University, Sendai, are to be recorded. The material comprises the collections of Professors H. Yabe, R. Aoki and S. Hanzawa, and several members of the Institute, Messrs. S. Nomura, F. Ueda, H. Niino and M. Nakamura, and of myself, made at various places in Japan. The localities exend over the prefectures, from north to south, of Aomori, Akita, Niigata, Isikawa, Tiba, Kanagawa, Sizuoka and Kôti.

Of the described species, *Bolivina hanzawai*, *B. subangularis ogasaensis*, *B. pseudodifformis*, *Loxostoma amygdalaeforme iokiense*, and *Bolivinita quadrilatera cuneata* are not found in the adjacent seas of Japan, while the others are living.

As to the generic names, I have followed Cushman's work entitled, "A Monograph of the Subfamily Virgulininae of the Foraminiferal Family Buliminidae."

Genus *Bolivina* d'Orbigny, 1839.

Bolivina d'Orbigny, Amér. Mérid. Vol. 5, pt. 5, 1839, p. 61 (Genotype, *Bolivina plicata* d'Orbigny); Cushman Lab. Foram. Res., Spec. Publ. No. 9, 1937, p. 36.

"Test elongate, usually compressed, tapering, initial end and often whole test twisted; chambers typically biserial; wall calcareous, finely or coarsely perforate, smooth or variously ornamented; aperture elongate, usually oblique, somewhat loop-shaped, often with an internal tube." (CUSHMAN)

According to CUSHMAN, the foraminifera of the genus, with the earliest appearance in the Jurassic, are widely distributed in the present oceans, and most abundant in about 50–150 fms. on the continental shelves or even in somewhat deeper water. The species as a rule are not long lived, and have a rather limited geographic distribution.

Bolivina is considered to be derived from *Virgulina* by the reduction of the triserial portion in early stages.

Bolivina hantkeniana BRADY

Pl. 16(5) figs. 1, 15.

1884. *Bolivina hantkeniana* BRADY, Rep. Voy. Challenger Zool., Vol. 9, p. 424, pl. 52, figs. 16–18.
1900. *Bolivina hantkeniana* MILLETT, Jour. Roy. Micr. Soc., pt. 9 p. 546, pl. 4, fig. 9.
1911. *Bolivina hantkeniana* CUSHMAN, U. S. Nat. Mus., Bull. 71, pt. 2, p. 42, text-fig. 68.
1921. *Bolivina hantkeniana* CUSHMAN, Ibid., Bull. 100, p. 132, pl. 27, fig. 2.
1924. *Bolivina hantkeniana* CUSHMAN, Carnegie Inst. Washington, Publ. 342, p. 16, pl. 6, figs. 1, 2.
1937. *Bolivina hantkeniana* CUSHMAN, CUSHMAN Lab. Foram. Res., Spec. Publ. No. 9, p. 127, pl. 16, figs. 18–20.

The species, widely distributed in the Pacific, also occurs in the Plio-Pleistocene deposits of Japan, though lacking in those of the Japan Sea side, both fossill and recent. There are two varieties, test very broad with a distinct, transparent keel about the entire periphery in one variety and narrow without keel or with that greatly reduced in the other. Both forms are found together, having in common the characteristic costae on the test.

Distribution in Japan:
Recent: Pacific.
Fossil: Plio-Pleistocene of Tiba, Kanagawa, and Sizuoka prefectures.

Bolivina robusta BRADY

Pl. 16 (5) figs. 5a, b.

1884. *Bolivina robusta* BRADY, Rep. Voy. Challenger Zool., Vol. 9, p. 421, pl. 53, figs. 7–9.
1893. *Bolivina robusta* EGGER, Abh. kön. bay. Akad. Wiss, München, Cl. II, Vol. 18, p. 294, pl. 8, figs. 31, 32.
1911. *Bolivina robusta* CUSHMAN, U. S. Nat. Mus., Bull. 71, pt. 2, p. 36, text-figs. 59, 60.
1931. *Bolivina robusta* HADA, Sci. Rep. Tôhoku Imp. Univ. Sendai, Japan, Ser. 4, Vol. 6, p. 131, text-fig. 88.
1937. *Bolivina robusta* CUSHMAN, CUSHMAN Lab. Foram. Res., Spec. Publ. No. 9, p. 131, pl. 17, figs. 1–4.

There are many records for this species ranging from the Eocene to recent.

Distribution in Japan:
Recent: Pacific, and Japan Sea.
Fossil: Plio-Pleistocene of Tiba, Kanagawa and Sizuoka prefectures.

Bolivina seminuda CUSHMAN

Pl. 16 (5) fig. 10.

1911. *Bolivina seminuda* CUSHMAN. U. S. Nat. Mus., Bull. 71, pt. 2, p. 34, text-fig. 55.
1927. *Bolivina seminuda* CUSHMAN, Scripps Inst. Oceanogr. Tech. Ser., Vol. 1, p. 157, pl. 3, fig. 6,
1931. *Bolivina seminuda* HADA, Sci. Rep. Tôhoku Imp. Univ. Sendai, Japan, Ser. 4, Vol. 6, p. 132. text-fig. 89.
1937. *Bolivina seminuda* CUSHMAN, CUSHMAN Lab. Foram. Res. Spec. Publ., No. 9, p. 142, pl. 18, figs. 13, 14.

CUSHMAN states, "The species ranges southward along the Pacific coast as far at least as Panama, and westward across the Pacific to Japan, where it is recorded by HADA from shallow water of Hokkaidô and Mutsu Bay."

The species occurs commonly in the Plio-Pleistocene of California and Japan.

Distribution in Japan:
  Recent: J pan Sea and Pacific.
  Fossil: Pliocene of Akita and Niigata prefectures and Plio-Plestocene of Tiba and Kanagawa prefectures.

Bolivina hanzawai ASANO

Pl. 16 (5) figs. 8, 13a, b.

1936. *Bolivina hanzawai* ASANO, Jap. Jour. Geol. Geogr., Vol. 13, No. 3-4, p. 330, pl. 37, figs. 9a, b.
1937. *Bolivina hanzawai* CUSHMAN, CUSHMAN Lab. Foram. Res., Spec. Publ. No. 9, p. 111, pl. 13, fig. 1.

Test broad, compressed, apex bluntly pointed, edges except at aperture surrounded by a thin wing-like flange; chambers almost flattened; sutures distinct; 2–3 short longitudinal costae at earlier portion of test; wall thin, with rather coarse perforations; aperture oval, terminal.

The types are from the Pliocene of Asuka, Taruki-mura, Ogasa-gun, Sizuoka prefecture. The species differs from *B. hantkeniana* BRADY by the few costae on earlier portion of test.

Distribution in Japan:
  Recent: unknown.
  Fossil: Pliocene of Sizuoka and Kôti prefectures,

Bolivina subangularis ogasaensis ASANO

Pl. 16 (5) fig. 16.

1936. *Bolivina subangularis ogasaensis* ASANO, Jap. Jour. Geol. Geogr., Vol. 13, Nos. 3-4, p. 334, pl. 37, fig. 8.
1937. *Bolivina subangularis ogasaensis* CUSHMAN, CUSHMAN Lab. Foram. Res., Spec. Publ. No. 9, p. 114, pl. 13, fig. 2.

This subspecies differs from the typical *subangularis* BRADY in the ornamentation of the test which consists of two prominent and never irregularly curved costae.

The types are from the Pliocene of Hosoya, Haranotani-mura, Ogasa-gun, Sizuoka prefecture.

Distribution in Japan :
Recent : unknown.
Fossil : Pliocene of Sizuoka prefecture.

Bolivina bradyi n. sp.

Pl. 16 (5) figs. 2, 14.

1884. *Bolivina beyrichi* BRADY, Rep. Voy. Challenger Zool. Vol. 9, p. 422, pl. 53, fig 1.

Test elongate, about 4 time as long as broad, rather narrow, much compressed, apical end bluntly pointed, apertural end evenly rounded; chambers numerous, increasing rapidly in height as added, each distinctly prolonged backward to a point projecting at outer edge; sutures distinct, oblique or gently curved; wall smooth, punctuate; aperture elongate, terminal. Length up 0.8 mm.

Holotype (Reg. No. 21424) from the Sôyô-maru station 352, west coast of Kii peninsula, in 154 meters.

The present form, once referred to *B. beyrichi* REUSS by BRADY, may be distinguished from the latter by the shape of chambers and by more elongate test. According to CUSHMAN, *B. beyrichi* REUSS occurs at numerous localities in Central Europe in the middle Oligocene, but the specimens from later and earlier Tertiary formations and also the Recent specimens referred to the same species are decidedly distinct from it.

Distribution in Japan :
Recent : Pacific.
Fossil : Pliocene of Taya, Kawabe-gun, Akita prefecture, and Plio-Pleistocene of Kanagawa prefecture.

Bolivina pseudodifformis n. sp.

Pl. 16 (5) figs. 4a, b.

Test similar to that of *B. difformis* WILLIAMSON (Rec. Foram. Gt. Britain, 1858, p. 6, figs. 166, 167), but much more elongated and narrower test.

Distribution in Japan :
Recent : unknown.
Fossil : Pliocene of Tiba prefecture.

Holotype (Reg. No. 21425) from the Pliocene of Sanuki-mati, Kimitu-gun Tiba prefecture.

Bolivina alata (SEGUENZA)

1884. *Bolivina beyrichi* REUSS var. *alata* BRADY, Rep. Voy. Challenger Zool., Vol. 9, p. 422, pl. 53, figs. 2-4.

1910. *Bolivina beyrichi* REUSS var. *alata* SIDEBOTTOM, Mem. Proc. Manchester, Lit. Philos. Soc., Vol. 54, pt. 3, p. 13.

1937. *Bolivina alata* CUSHMAN, CUSHMAN Lab. Foram. Res., Special Publ., No. 9, p. 106, pl. 13, figs 3-11.

Several specimens referrable to SEGUENZA's *alata* were found in the recent material from the Pacific side of Japan.

Distribution in Japan :

Recent : Fairly common in the Pacific side of Japan, but absent in the Japan Sea.
Fossil : unknown.

Bolivina spinescens CUSHMAN

Pl. 16 (5) fig. 5.

1884. *Bolivina textilarioides* BRADY (not REUSS), Rep. Voy. Challenger Zool., Vol. 9, p. 419, pl. 52, figs. 24, 25.
1900. *Bolivina textilarioides* MILLETT, Jour. Roy. Micr. Soc., p. 542, pl. 4, fig. 5.
1911. *Bolivina spinescens* CUSHMAN, U. S. Nat. Mus., Bull. 71, pt. 2, p. 46.
1932. *Bolivina spinescens* HERON-ALLEN & EARLAND, Discovery Rep., Vol. 4, p. 354, pl. 9, figs. 7, 8.
1934. *Bolivina spinescens* EARLAND, Ibid., Vol. 10, p. 132, pl. 6, figs. 8–10.
1937. *Bolivina spinescens* CUSHMAN, CUSHMAN Lab. Foram. Res., Special Publ. No. 9, p. 142, pl. 18, figs. 17–19.

The present species is widely distributed in deep water of the Pacific. CUSHMAN already recorded it from the southern coast of Japan and from the area between Yokohama and Guam. Recently HERON-ALLEN and EARLAND record it from off the Falkland Islands.

Distribution in Japan :
Recent ; Pacific.
Fossil ; unknown.

Bolivina striatula CUSHMAN

Pl. 16 (5) fig. 18.

1922. *Bolivina striatula* CUSHMAN, Carnegie Instit. Washington, Publ. 311, p. 27, pl. 3, fig. 10.
1922. *Bolivina striatula* CUSHMAN, U. S. Nat. Mus. Bull. 104, pt. 3, p. 43.
1931. *Bolivina striatula* CUSHMAN and PARKER, Ibid. Proc., Vol. 80, Art. 3, p. 16, pl. 3, figs. 21a, b.
1931. *Bolivina striatula* COLE, Florida St. Geol. Surv., Bull. 6, p. 41, pl. 2, fig. 9.
1937. *Bolivina striatula* CUSHMAN, CUSHMAN Lab. Foram. Res. Special Publ. No. 9, p. 154, pl. 18, figs. 30, 31.

CUSHMAN states that the species is fairly in the Western Indian region southward to the coast of Brazil. The occurrence of this species in the Western Pacific is noticeable in its distribution.

Distribution in Japan :
Recent: Pacific side of Japan.
Fossil : unknown.

Bolivina aenariensis (COSTA)

Pl. 16 (5) fig. 21.

Compare with: 1937. *Bolivina aenariensis* CUSHMAN, CUSHMAN Lab. Foram. Res., Special Publ. No. 9, p. 105, pl. 12, figs. 21–26.

Several specimens referrable to the present species were obtained from the Pacific side of Japan:

Distribution in Japan :
Recent : Pacific.
Fossil : unknown.

Genus *Loxostoma* EHRENBERG, 1854

Loxostomum EHRENBERG, Mikro. Geol., 1854, pl. 17, fig. 19 (Genotype, *Loxostoma subrostratum* EHRENBERG).
Loxostoma HOWE, Jour. Pal., Vol. 4, 1930, p. 329; CUSHMAN, CUSHMAN Lab. Foram. Res., Special Publ. No. 9, 1937, p. 168.
Bolivina (part) of authors.

Test in the earlier stages similar to ***Bolivina***, in adult tending to become uniserial with terminal aperture.

This genus with its early members, appearing in the upper Cretaceous, continues to the present oceans; its greatest development seems to be in the present tropical waters at moderate depth.

Loxostoma amygdalaeforme (BRADY)

Pl. 16 (5) fig. 7.

1884. *Bolivina amygdalaeformis* BRADY, Rep. Voy. Challenger Zool. Vol. 9, p. 426, pl. 53, figs. 28, 29.
1911. *Bolivina amygdalaeformis* CUSHMAN, U. S. Nat. Mus., Bull. 71, pt. 2, p. 42, text-figs. 69a, b.
1921. *Bolivina amygdalaeformis* CUSHMAN, Ibid., Bull. 100, p. 133, pl. 26, fig. 3.
1937. *Loxostoma amygdalaeforme* CUSHMAN, CUSHMAN Lab. Foram Res., Special Publ. No. 9, p. 183. pl. 21, figs. 21-23.

The types are from a Challenger station off the Philippines in 95 fathoms. There are also many records of this species from the late Tertiary and recent material of the Indo-Pacific region.

Distribution in Japan:
Recent: Pacific side of Japan.
Fossil: unknown.

Loxostoma karrerianum (BRADY)

Pl. 16 (5) figs. 6a, b; 12a, b.

1884. *Bolivina karreriana* BRADY, Rep. Voy. Challenger Zool., Vol. 9, p. 424, pl. 53, figs. 19-21.
1893. *Bolivina karreriana* EGGER, Abh. kön. bay. Akad., Wiss., München, Cl. II, Vol. 18, p. 299, pl. 8, figs. 38, 39.
1911. *Bolivina karreriana* CUSHMAN, U. S. Nat. Mus., Bull. 71, pt. 2, p. 40, text-fig. 65.
1921. *Bolivina karreriana* CUSHMAN, Ibid., Bull. 100, p. 131, pl. 26, fig. 4.
1937. *Loxostoma karrerianum* CUSHMAN, CUSHMAN, Lab. Foram. Res., Spec. Publ., No. 9, p. 184, pl. 21, fig. 17.

The types are from the Challenger station 232, in 345 fms., south of Japan. The species is widely distributed in the Pacific in fairly deep water. It is most abundant off southern Japan and off New Zealand.

Distribution in Japan:
Recent: Pacific and Western Japan Sea, but doubtful in the Northern Japan Sea.
Fossil: Plio-Pleistocene of Tiba, Kanagawa, and Sizuoka prefectures.

Loxostoma amygdalaeforme iokiense n. subsp.

Pl. 16 (5) figs. 3a, b.

The present fossil differs from the typical *amygdalaeforme* by the prominent raised costae which ornament the whole test.

Holotype (Reg. No. 21426) from the Pliocene of Ioki, Aki-gun, Kôti prefecture.

CUSHMAN records *L. amygdalaeforme* (BRADY) from the Albatross stations D 4875, Korea Strait, in 59 fms., D 4964, off southeastern Japan, in 37 fms., and D 4883, Eastern Sea of Japan, in 53 fms. The present subspecies has not yet been found in the adjacent seas of Japan.

Genus *Bifarina* PARKER and JONES, 1872

Bifarina PARKER & JONES, Ann. Mag. Nat. Hist., ser. 4, Vol. 10, 1872, p. 198 (Genotype, *Dimorphina saxipara* EHRENBERG); CUSHMAN, CUSHMAN Lab. Foram. Res., Special Publ. No. 9, 1937, p. 196

Dimorphina EHRENBERG, 1854.

"Test with the earlier chambers biserial, later ones uniserial, uniserial portion making up most of the test in most species; wall calcareous, perforate: aperture in the young as in *Bolivina*. later terminal and rounded." (CUSHMAN)

According to CUSHMAN, the genus appearing first in the Jurassic, found its well developped species in the Eocene, but the best characterized species are the recent ones of the Indo-Pacific.

Bifarina japonica n. sp.

Pl. 16 (5) fig. 12.

Test elongate, early portion biserial; somewhat compressed, later portion uniserial, nearly rounded in transverse section; chambers distinct, excavated on lower side, often with a broad collar-like projection in a band about middle portion of uniserial chambers; sutures strongly depressed; wall smooth, except for raised band on each chamber; aperture terminal, elliptical with a distinct lip. Length ca. 1 mm.

Holotype (Reg. No. 21444) from the Sôyô-maru station 347, Kii Channel, in 126 fathoms.

The present form more or less resembles *B. fimbriata* (MILLETT), but may be easily distinguished from it by the different characters of chambers.

Distribution in Japan:

Recent: Pacific side of Japan.

Fossil: unknown.

Genus *Rectobolivina* CUSHMAN, 1927

Rectobolivina CUSHMAN, Contr. CUSHMAN Lab. Foram. Res., Vol. 3, 1927, p. 68. (Genotype, *Sagrina bifrons* BRADY)

Sagrina (part) and *Siphogenerina* (part) of authors.

Test elongate, somewhat compressed, early chambers biserial, later uniserial; wall calcareous, perforate; aperture terminal, rounded with a slight lip.

Some of the forms have been placed in *Siphogenerina*, and the generic position of some of the species is confusing.

Rectobolivina bifrons (BRADY)

Pl. 16 (5) figs. 11a, b.

1884. *Sagrina bifrons* BRADY, Rep. Voy. Challenger Zool., Vol. 9, p. 582. pl. 75, figs. 18–20.

1893. *Siphogenerina bifrons* EGGER, Abh. kön. bay. Akad. Wiss., München, Cl. II, Vol., 18 p. 317, pl. 9, figs. 25, 26, 29.
1913. *Siphogenerina bifrons* CUSHMAN, U. S. Nat. Mus., Bull. 71, pt. 3, p. 105, pl. 45, figs. 1, 2, 5–7.
1921. *Siphogenerina bifrons* CUSHMAN, Ibid., Bull. 100, p. 277, pl. 36, figs. 2, 3.
1926. *Siphogenerina bifrons* CUSHMAN, Ibid., Proc., Vol. 67, art. 25, p. 16, pl. 3, figs. 7–9; pl. 4, fig. 4.
1927. *Rectobolivina bifrons* CUSHMAN, Contr. CUSHMAN Lab. Foram. Res., Vol. 3, p. 68.
1937. *Rectobolivina bifrons* CUSHMAN, Ibid., Spec. Publ., N. 9, p. 204, pl. 23, figs. 13, 14.

This species is best developed in the region from Japan southward to the Philippines and Malay Archipelago.

Distribution in Japan:
Recent: Pacific unknown in the Japan Sea.
Fossil: Plio-Pleistocene of Tiba and Sizuoka prefectures.

Genus *Bolivinella* CUSHMAN, 1927

Bolivinella CUSHMAN, Contr. CUSHMAN, Lab. Foram. Res. Vol. 2, pt. 4, 1927, p. 79 (Genotype, *Textularia folium* PARKER and JONES.)

"Test much compressed, the proloculum in the megalospheric form rectangular, in the microspheric form the young is apparently planospiral, later chambers biserial, chambers long and recurved, not overlapping; wall calcareous, perforate; aperture transverse to the compression of the test with numerous papillae at the base of the opening." (CUSHMAN)

This genus occurs in the Eocene and continues to the present sea, especially of the Indo-Pacific.

Bolivinella folium (PARKER and JONES)

Pl. 16 (5) fig. 20.

1884. *Textularia folium* BRADY, Rep. Voy. Challenger Zool., Vol. 9, p. 357, pl. 42, figs. 1–5.
1936. *Bolivinella elegans* ASANO, Jour. Geol. Soc. Japan. Vol. 43, No. 515, p. 619, pl. 33, fig. 3.

There are considerable variations in this species. The present form is very similar to BRADY's figure 3.

Distribution in Japan:
Recent: Sôyô Maru station 345, off Murotozaki, Sikoku, in 199 meters.
Fossil: Pliocene of Nakanosawa, Kuromatunai-mura, Suttu-gun, Hokkaidô,

Genus *Bolivinita* CUSHMAN, 1927

Bolivinita CUSHMAN, Contr. CUSHMAN Lab. Foram. Res., Vol. 2, pt. 4, 1927, p. 90 (Genotype, *Textularia quadrilatera* SCHWAGER.)

"Test with chambers biserial, periphery and broader sides all concave with strongly developed angles giving a quadrate end view to the test; wall calcareous, perforate; aperture large at base of inner margin in the median line." (CUSHMAN)

The members of this genus seem to be common in shallow, warm waters of the present oceans.

Bolivinita quadrilatera (SCHWAGER)

Pl. 16 (5) figs. 17, 18.

1866. *Textularia quadrilatera* SCHWAGER, Novara Exp. Geol. Theil., Vol. 2, p. 253, pl. 7, fig. 10.

1884. *Textularia quadrilatera* BRADY, Rep. Voy. Challenger Zool., Vol. 9, p. 358, pl. 42, figs. 8-12
1897. *Textularia quadrilatera* FLINT, U. S. Nat. Mus., Misc. Rep., p. 283, pl. 28, fig. 3.
1911. *Textularia quadrilatera* CUSHMAN, Ibid., Bull. 71, pt. 2, p. 24, text-figs. 42-44.

The present form seems to be widely distributed in the northwestern Pacific. The types are from the Pliocene of Kar Nikobar.

Distribution in Japan:
Recent: Pacific; unknown in Japan Sea.
Fossil: Pleistocene of Tiba, Kanagawa, Sizuoka and Kôti prefectures.

Bolivinita quadrilatera cuneata n. subsp.

Pl. 16 (5) figs. 19a, b.

Test nearly wedge-shaped, similar to that of *B. quadrilatera* (SCHWAGER), but differing from it by curved chambers which overlap the predecessors.

Holotype (Reg. No. 21427) from the Plio-Pleistocene of Muraoka-mura, Kamakura-gun, Kanagawa prefecture,

Distribution in Japan:
Recent: unknown.
Fossil: Plio-Pleistocene of Kanagawa prefecture.

Genus *Geminaricta* CUSHMAN, 1936

Geminaricta CUSHMAN, CUSHMAN Lab. Foram. Res., Special Publ. No. 9, p. 61.
Bolivinella CUSHMAN (part), Contr. CUSHMAN Lab. Foram. Res., Vol. 5, 1929, p. 33.

"Test in the early stages biserial, compressed, in the adult uniserial; wall calcareous, perforate; aperture in the adult consisting of a small rounded openings well separated from one another toward the ends of an elongate, elliptical depression in the terminal wall." (CUSHMAN)

The genus is a specialized one and has been confined to the Miocene of the southern France. But CUSHMAN says, "It is possible that this genus may be found in the Indo-Pacific or Australian regions, as other forms of the Miocene of France show this range."

Geminaricta pacifica n. sp.

Pl. 16 (5) figs. 22a, b.

Test nearly triangular, early portion biserial, and tapering, later portion uniserial, sides nearly parallel, periphery in early portion acute, later rounded; chambers distinct, not inflated; sutures distinctly raised, very slightly curved; wall roughened; aperture terminal, elongate, with two small openings at both ends. Length up to 0.5 mm.

Holotype (Reg. No. 21445) from the Sôyô-Maru station 578, Toyama Bay, in 187 fathoms. This is the first record of the recent form of this genus.

Distribution in Japan:
Recent: Toyama Bay, Japan Sea.
Fossil: unknown.

Finally I wish to offer my warmest thanks to Prof. H. YABE of the Institute of Geology and Palaeontology, Tôhoku Imperial University, Sendai, Japan, under whose direction I am studying the Neogene Foraminifera faunas of Japan, for kindly correcting and reconstructing this note before publication.

日本産 *Bolivina* 屬有孔蟲 （摘要）

淺野清

Bolivina 及其近似屬の有孔蟲に關しては，最近 Cushman の monographic study があり，可成りよく知られるに至つた。日本産のものに就いて之を調査せしに，20 種を識別することが出來た。其等の中 *Bolivina hanzawai, B. subangularis ogasaensis, B. pseudodifformis, Loxostoma amygdulaeforme iokiense, Bolivinita quadrilatera cuneata* は日本の太平洋側の鮮新世のみから發見され，其他の地方からは，現世，化石共に知られてゐないことは注目すべきである。尙ほ *Geminaricta* 屬の有孔蟲は，從來歐洲の Miocene のみに限られてゐたものであるが，蒼鷹丸採集の現世標本有孔蟲のうちに，本屬のものと考へられる 1 新種を發見した。本文には之等の屬及種に就いての考察を述べたものである。

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67. *On the Japanese Species of Uvigerina and Its Allied Genera*

By

Kiyosi Asano

(Contribution from the Institute of Geology and Palaeontology, Tôhoku Imperial University, Sendai, Japan: Received January 18th, 1937; read February 12th, 1938)

In the collection of fossil foraminifera from Japrn of the Institute of geology and Palaeontology, there are numerous specimens of the three genera, *Uvigerina*, *Angulogerina* and *Trifarina*, their localities are;

1. Wakimoto, Oga Peninsula, Akita prefecture; Pliocene; Coll. K. Asano.
2. Taya, Iwamisannai-mura, Kawabe-gun, ditto; Pliocene; Coll. K. Asano.
3. Sade Island, Niigata prefecture; Pliocene; Coll. Y. Ozawa.
4. Natukawa-dani, Kitadyô-mura, Kariha-gun, ditto; Pliocene; Coll. K. Hanzawa.
5. Tagawa, Konado-mura, Nisi-tonami-gun, Toyama prefecture; Pliocene; Coll. K. Asano.
6. Sematanoseki, Sitô-mura, Itihara-gun, Tiba prefecture; Pleistocene; Coll. M. Nakamura.
7. Sanuki-mati, Kimitu-gun, ditto; Pliocene; Coll. F. Ueda.
8. Kamo, Toyato-mura, Awa-gun, ditto; Pliocene; Coll. F. Ueda.
9. Hiroseitiba, Kokubunzi-mura, ditto; Pliocene; Coll. F. Ueda.

10. Nisi-Nagata, Toyohusa-mura, ditto ; Pliocene ; Coll. F. Ueda.
11. Takaya, Tomioka-mura, Kamakura-gun, Kanagawa prefecture ; Plio-Pleistocene ; Coll. F. Ueda.
12. Yazu, Kanazawa-mati, Kuraki-gun, ditto ; Pliocene ; Coll. M. Nakamura.
13. Nozima, ditto, Pliocene ; Coll. M. Nakamura.
14. Osikiri, Hôngô-mura, Kamakura-gun, ditto ; Plio-Pleistocene ; Coll. M. Nakamura.
15. Naganuma, Toyota-mura, ditto ; Plio-Pleistocene ; Coll. F. Ueda.
16. Asuka, Taruki-mura, Ogasa-gun, Sizuoka prefecture ; Pliocene ; Coll. R. Aoki.
17. Kamiyasiki, ditto ; Piocene ; Coll. R. Aoki.
18. Hosoya, Haranotani-mura, ditto ; Pliocene ; Coll. R. Aoki.
19. Sugiya, Nangô-mura, ditto ; Coll. R. Aoki.
20. Ketienzi, ditto ; Coll. R. Aoki.

Most of these fossils belong to recent species, but several are not known from the adjacent seas of Japan.

There are 12 species of *Uvigerina* and its allied genera in Japan, namely: .

	Geological range in Japan
Uvigerina pygmaea d'Orbigny	Pliocene-Pleistocene-Recent
U. cf. *bifurcata* d'Orbigny	”
U. *tenuistriata* Reuss.	”
U. *mediterranea* Hofker	”
U. *schwageri* Brady	”
U. *aculeata* d'Orbigny	”
U. cf. *peregrina* Cushman	Pliocene
U. *yabei* n. sp.	”
U. *substriata* n. sp.	”
U. *pseudoampullacea* n. sp.	Recent
Angulogerina japonica n. sp.	”
Trifarina bradyi Cushman	”

Of these forms, *U. yabei*, *U. substriata* and *U.* cf. *peregrina* are not yet known living, while *U. mediterranea*, *U. tenuistriata* and *U. schwageri* are fairly common in the Plio-Pleistocene depodits of Tiba, Kanagawa and Sizuoka prefectures, but apparently absent in those of the Japan Sea side. Other forms are widely distributed in Japan, both fossil and recent.

As a rule, *Uvigerina* and its allied genera are abundant in fairly deep water of the present seas.

Before going into the descriptions of the species, the writer wishes to offer his warmest thanks to Prof. H. Yabe of the Institute of Geology and Palaeontology, Tôhoku Imperial University, Sendai, Japan, under whose supervision the present work was carried out, for kind suggestions and correction of this article before publication ; he is indebted to those who kindly submitted their specimens to him for study.

Genus *Uvigerina* d'Orbigny, 1826

Uvigerina d'Orbigny, Ann. Sci. Nat., vol. 7, 1826, p. 269. (Genotype, *U. pigmaea* d'Orbigny)
Uhligina Schubert, Sitz deut. naturw. med. Ver. Böhmen, 1899, p. 222.

"Test generally triserial, elongate, fusiform, rounded in transverse section; chambers distinct and inflated; wall calcareous, perforate; aperture terminal, rounded, with a neck and phialine lip, often with a spiral tooth and an internal twisted tube." (CUSHMAN)

Uvigerina seems to have been derived from *Uvigerinella* with a virguline aperture. The members of this genus are, in general, specifically distinguished from one another by the difference in the form and arrangement of chambers and in the ornamentation of wall. Although some species of *Uvigerina* have short geologic ranges and are good horizon makers, most of the species are difficult to distinguish, and too rare in occurrence to be of much stratigraphic value.

Uvigerina pygmaea d'ORBIGNY

Compare with: *Uvigerina pygmaea* CUSHMAN, On *Uvigerina pygmaea* d'ORBIGNY, Contr. Cushman, Lab. Foram. Res., vol. 6, pt. 3, 1930, p. 62, pl. 9, figs. 14-20.

Various forms of costate Uvigerinae have been referred to this species by many authors. In 1927, CUSHMAN visited the type locality, Coroncina, near Siena, Italy and collected abundant material. According to his study, the test of this species is fairly small and elongate, with the width of initial end differing much in the microspheric and megalospheric forms. All but the last one or two chambers have rather sharp longitudinal costae, usually discontinuous over sutures; costae are replaced by numerous short spines on the last one or two chambers.

The apertural end has a distinct neck, elongate and slender, and in well preserved specimens thers is a distinct lip. The specimens at my disposal from the Plio-Pleistocene of Japan, as shown on Plate 17 (6), figs. 5-7 varys considerably in the shape of chambers, but otherwise are quite similar to d'ORBIGNY's *pygmaea*, illustrated by CUSHMAN.

Distribution in Japan:

Recent: Pacific and Japan Sea.

Fossil: Pliocene of Akita, Niigata, and Toyama prefectures (1, 2, 4, 5); Plio-Pleistocene of Tiba prefecture (6, 7).

Uvigerina cf. *bifurcata* d'ORBIGNY

Pl. 17 (6) figs. 3, 4.

Compare with: 1839. *Uvigerina bifurcata* d'ORBIGNY, Foram. Amér. Mérid., p. 53, pl. 7, fig. 17.
1858. *Uvigerina pygmaea* WILLIAMSON, Rec. Foram. Gt. Britain, p. 66, pl. 5, figs. 138, 139.
1884. *Uvigerina pygmaea* BRADY (part), Rep. Voy. Challenger Zool., vol. 9, p. 575, pl. 74, figs. 13, 14.

d'ORBIGNY distinguishes *U. bifurcata* from *U. pygmaea* by the arrangement of costae, which "au lieu de se continuer sur tout l'hauteur de chaque loge, sout interrompues, ou bifurquées, caractère constant chez tous les individus." But WILLIAMSON and BRADY say that the difference is not sufficient to consititute a specific distinction. CUSHMAN, emphasizes that BRADY's figures of *U. pygmaea* d'ORBIGNY in the Challenger Report are of two distinct species. The writer considers that BRADY's figures 13, and 14 on Plate 74, may be separated from the others

(Figs. 11, 12) by the well-defined raised costae and more slender and elongate test. These forms are perhaps referrable to d'ORBIGNY's *bifurcata*, but an accurate identification is impossible without a study of the original specimen.

Distribution in Japan:

Recent: Japan Sea and Pacific.

Fossil: Pliocene of Akita, and Niigata prefectures (1, 3, 4); Plio-Pleistocene of Tiba and Kanagawa prefectures (7, 10, 12, 13, 15).

Uvigerina mediterranea HOFKER

Pl. 17 (6) figs. 8, 10, 11, 14, 15.

1932. *Uvigerina mediterranea* HOFKER, Publ. Staz. Zool. Napoli, vol. 12, Fasc. 1, p. 118, text-fig. 32.

The present form, once referred by many authors to *U. pygmaea* d'ORBIGNY, was first separated by HOFKER from the typical d'ORBIGNY's *pygmaea*. According to HOFKER there are three forms in this species; one is larger than the two others, which are transitionally variable to one another, and generally slender, tapering to the initial end. These three forms explained to be due to "Trimorphism" are respectively named as B, A1 and A2 forms.

Distribution in Japan:

Recent: Pacific.

Fossil: Plio-Pleistocene of Tiba and Kanagawa prefectures (7; 10, 11, 14, 15) and Pliocene of Sizuoka prefecture (17, 20)

Uvigerina tenuistriata REUSS

Pl. 17 (6) figs. 12, 13.

1884. *Uvigerina tenuistriata* BRADK, Rep. Voy. Challenger Zool., vol. 9, p. 574, pl. 74, figs. 4–7.

1893. *Uvigerina tenuistriata* EGGER, Abh. kön. bay. Akad. Wiss.. Cl. II, vol. 18, p. 315, pl. 9, figs 44, 52.

1913. *Uvigerina tenuistriata* CUSHMAN, U. S. Nat. Mus., Bull. 71, pt. 3, p. 95, pl. 42, fig. 4.

1921. *Uvigerina tenuistriata* CUSHMAN, Ibid., Bull. 100, p. 269, pl. 55, fig. 2.

1926. *Uvigerina tenuistriata* CHAPMAN, New Zealand. Geol. Surv., Pal. Bull. II, p. 70, pl. 14, fig. 9.

Test elongate, subcylindrical, tapering to apical end, composed of numerous chambers ornamented with numerous fine, longitudinal costae; sutures distinct; aperture with a short tubular neck and a distinct phialine lip.

The species may easily be distinguishable from *U. mediterranea* HOFKER by much elongate test with very finely striated ornamentation.

Distribution in Japan:

Recent: Pacific, and Wakasa Bay, Japan Sea.

Fossil: Plio-Pleistocene of Takaya, Muraoka-mura, Kamakura-gun, Kanagawa prefecture.

Uvigerina schwageri BRADY

Pl. 17 (6) figs. 19, 20, 24, 30.

1884. *Uvigerina schwageri* BRADY, Rep. Voy. Challenger Zool., vol. 9, p. 575, pl. 74, fig. 8-10.

1913. *Uvigerina schwageri* Cushman, U. S. Nat. Mus., Bull. 71, pt. 3, p. 97, pl. 37, figs. 3, 4.
1921. *Uvigerina schwageri* Cushman, Ibid., Bull. 100, p. 270, pl. 55, figs. 3-5.

The species originally described by Brady from the Philippines is very common in the region. Cushman says "Apparently the region south of Japan, where so many species reach their northern limits, is too cold for this species, for it was not noted there." The species is also absent in our collection of recent Foraminifera from the adjacent seas of Japan, but fairly common in the Plio-Pleistocene of Tiba and Sizuoka prefectures.

Distribution in Japan:
Recent: unknown.
Fossil: Pliocene of Tiba and Sizuoka prefectures (8, 9, 10, 18, 19).

Uvigerina aculeata d'Orbigny

Pl. 17 (6) fig. 23.

1846. *Uvigerina aculeata* d'Orbigny, Foram. Foss. Vienne, p. 191, pl. 11, figs. 27, 28.
1884. *Uvigerina aculeata* Brady, Rep. Voy. Challenger Zool., vol. 9, p. 578, pl. 75, figs. 1, 2.
1913. *Uvigerina aculeata* Cushman, U. S. Nat. Mus., Bull. 71, pt. 3, p. 100, pl. 43, fig. 4.
1921. *Uvigerina aculeata* Cushman, Ibid., Bull. 100, p. 273, pl. 55, fig. 6.

Next to *Uvigerina schwageri* Brady this is a common species in the Philippine regions. Cushman records it from the Albatross Station D 4957, off Japan, in 437 fathoms.

Distribution in Japan:
Recent: Pacific.
Fossil: Pliocene of Tiba prefecture (8, 9, 10).

Uvigerina pseudoampullacea n. sp.

Pl. 17(6) figs. 28, 29.

Compare with: 1913 *Uvigerina ampullacea* Cushman (not Brady) U. S. Nat. Mus., Bull. 71, pt. 3, p. 102, pl. 42, figs. 3a, b.

Test elongate, composed of a more or less compact spiral of chambers in early portion followed by two or more chambers uniserially arranged; wall finely hispid; aperture with an elongate neck and phialine lip. Length up to 0.8 mm.

Holotype (Reg. No. 21428) from the Sôyô-Maru station 345, near Muroto-zaki, Sikoku, in 199 meters. Paratypes are from the Sôyô-Maru station 297, near Tanegasima in 516 meters.

Distribution in Japan:
Recent: Pacific along the coast of Southwestern Japan.
Fossil: unknown.

Uvigerina yabei n. sp.

Pl. 17(6) figs. 1, 2.

Test elongate, subcylindrical, tapering at apical end, composed of numerous chambers with several distinct longitudinal costae except last formed-chambers; aperture with a short neck and distinct phialine lip. Length up to 1.5 mm.

Holotype (Reg. No. 21429) from fhe Pliocene of Wakimoto, Oga Peninsula, Akita prefecture.

The present form is similar to *U. tenuistriata* REUSS, but differs in less number of costae. Furthermore the last few chambers are not ornamented with costae.

Distribution in Japan:

Recent: unknown.

Fossil: Pliocene Wakimoto sandy shale of Oga Peninsula, Akita prefecture.

Uvigerina substriata n. sp.

Pl. 17(6) figs. 21, 22.

Test subcylindrical, composed of 5 or 6 whorls; chambers numerous, inflated; sutures distinct, gently curved, depressed; wall striated only near sutures; aperture at end of a short neck and surrounded by a phialine lip. Length up to 1.8 mm.

Holotype (Reg. No. 21430) from the Plio-Pleistocene of Sanuki-mati, Kimitu-gun, Tiba prefecture.

This new species is very distinct in sutures crossed by numerous fine striae.

Uvigerina cf. *peregrina* CUSHMAN

Pl. 17(6) fig. 18.

Compare with: 1923. *Uvigerina peregrina* CUSHMAN, U. S. Nat. Mus., Bull. 104, pt. 4, p. 166, pl. 42, figs. 7–10.

1927. *Uvigerina peregrina* GALLOWAY and WISELER, Jour. Pal., vol. 1, No. 1, p. 76, pl. 12, figs. 1, 2.

The specimens are very close to CUSHMAN's *peregrina* in short, high plate-like costae, which are granular on surface, spinose or brocken near apertural and initial ends. But the last few chambers are considerably larger in the present fossil which is wedge-shaped in general outline of test.

Distribution in Japan:

Recent: doubtful.

Fossil: Pliocene Wakimoto sandy shale of Oga Peninsula, Akita prefecture.

Uvigerina sp.

Pl. 17(6) fig. 16.

Test very rmall, fusiform, composed of about 3 whorls; chambers few, very slightly inflated; sutures distinct, depressed; wall smooth, not ornamented; aperture terminal with a thickened lip and short neck.

The form differs from *U. canariensis* 'ORBIGNY by less number of chambers which are less inflated.

It is possible that this is merely a young stage of smooth surface Uvigerinae, such as *U. canariensis* d'ORBIGNY or *U. farinosa* HANTKEN.

Genus *Angulogerina* CUSHMAN, 1927

Angulogerina CUSHMAN, Contr. CUSHMAN Lab. Foram. Res., vol. 3, 1927, p. 69. (Genotype, *Uvigerina angulosa* WILLIAMSON)

Uvigerina (part) of authors.

"Test triserial, elongate, the whole test angled, with three flattened sides and distinct angles; wall calcareous, perforate; aperture at the end of a short neck, with a phialine lip." (Cushman)

Angulogerina is a specialized form not far removed from *Uvigerina*, in which, besides being trihedral, the later chambers tend to become uniserial.

Angulogerina japonica n. sp.

Pl. 17(6) fig. 17.

Test generally triangular in section, both ends sharply pointed, the angles with sharp carinae; chambers few, sometimes indistinct, only slightly inflated; sutures indistinct, slightly depressed; wall ornamented with several longitudinal costae; aperture terminal, with a short neck and distinct lip. Length up to 0.8 mm.

The present species differs from *A. angulosa* (Williamson) by the sharply pointed apical end and distinctly carinated edges.

Holotype (Reg. No. 21431) from Urasimasyô, Wakasa Bay, Japan Sea, in 190 meters.

Distribution in Japan:

Recent: Japan Sea.

Fossil: Pliocene of Ketienzi, Nangô-mura, Ogasa-gun, Sizuoka prefecture.

Angulogerina sp.

Pl. 17(6) fig. 26.

In this form chambers are very indistinct due to prominent costae; apical end is sharply pointed and edges are strongly carinated.

Distribution in Japan:

Recent: Sôyô-maru station 352, West coast of Kii Peninsula, in 154 maters.

Fossil: unknown.

Genus *Trifarina* Cushman 1923

Trifarina Cushman, U. S. Nat. Mus., Bull. 104, 1923, pt. 4, p. 99 (Genotype, *Trifarina bradyi* Cushman).

Rhabdogonium Brady (not Reuss) Rep. Voy. Challenger Zool., vol. 9, 1884, p. 524.

Triplasia Cushman (not Reuss) U. S. Nat. Mus., Bull. 71, 1913, pt. 3, p. 62.

"Test elongate, triangular in transverse section; the early chambers in an irregular spiral, later ones very loosely so or even uniserial; wall thin, translucent, finely punctate; aperture terminal not radiate, at the end of a short, often phialine lip." (Cushman)

Trifarina is a homeomorph of *Siphogenerina*, although it is not known to have a siphon.

Trifarina bradyi Cushman

1923. *Trifarina bradyi* Cushman, U. S. Nat. Mus., Bull. 104, pt. 4, p. 99, pl. 22, fig. 3-9.

There are numerous records for this species, both Pacific and Atlantic.

Distribution in Japan:

Recent: Sôyô-maru station 485, off the coast of Simane prefecture, Japan Sea in 93 meters.

Fossil: doubtful.

日本産 *Uvigerina* 屬有孔蟲（摘要）

淺野 清

日本産化石並に現在 *Uvigerina, Angulogerina, Trifarina* 3 屬の種，12 に就いて考察を爲した。秋田縣男鹿半島の鮮新世有孔蟲の一つ，*U. yabei* n. sp. 及び房總半島の *U. substriata* n. sp. は夫々の地方に於いて，特徴あるものであるが，其他の 10 種は，地理的及び地質的分布が廣く，且つ産出も多くのものは僅少であり，層位的價値は乏しい。

Explanation of Plate 14 (3)

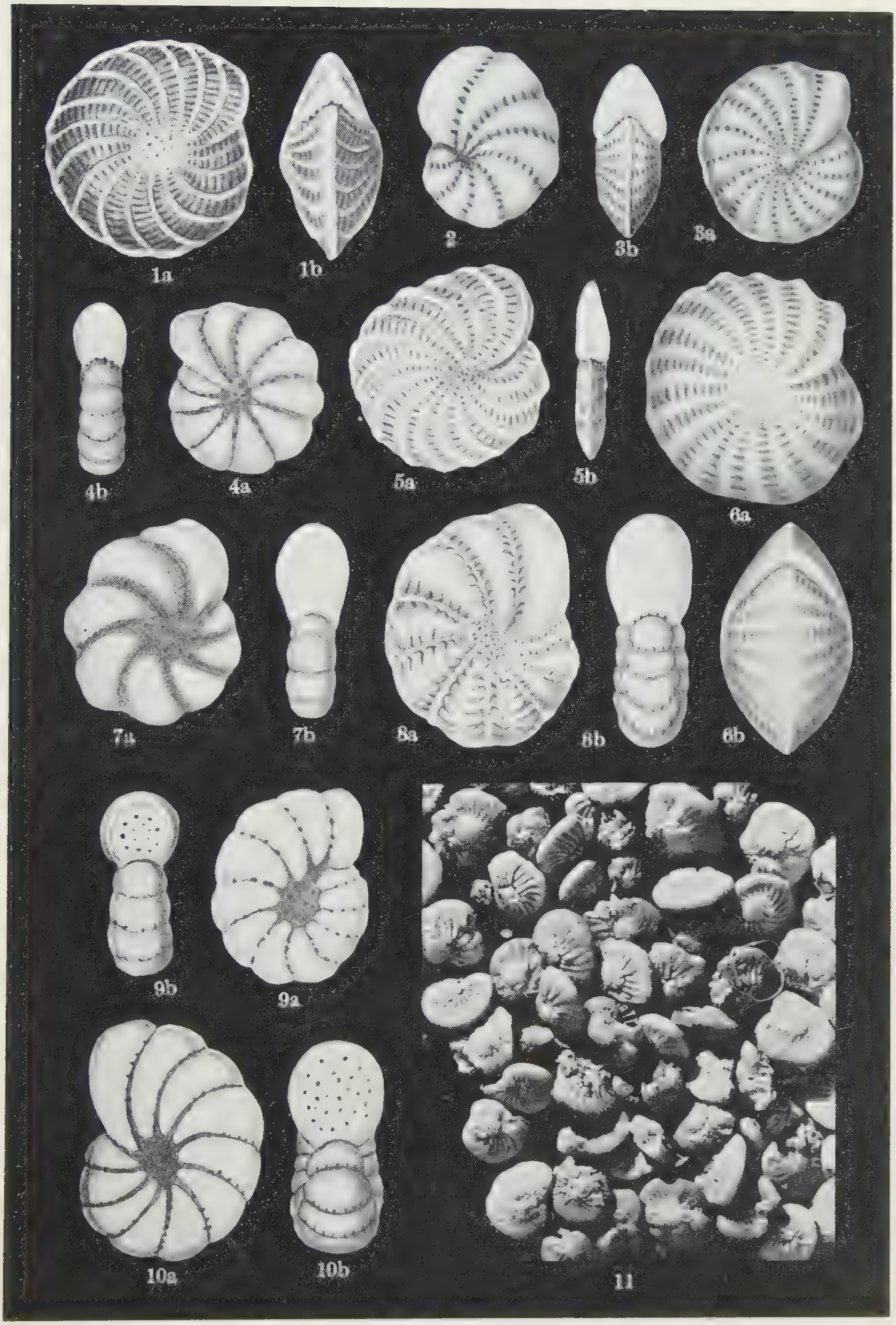
Figs. 1a, b.	*Elphidium crispum* (Linné) ×25.
Fig. 2.	*Elphidium kusiroense* n. sp. ×60.
Figs. 3a, b.	*Elphidium advenum* (Cushman) ×25.
Figs. 4a, b.	*Elphidium subgranulosum* n. sp. ×50.
Figs. 5a, b.	*Elphidium jenseni* (Cushman) ×25.
Figs. 6a, b.	*Elphidium craticulatum* (Fichtel and Moll) ×20.
Figs. 7a, b.	*Elphidium* cf. *fabum* (Fichtel and Moll) ×25.
Figs. 8a, b.	*Elphidiella nagaoi* n. sp. ×20.
Figs. 9a, b; 10a, b.	*Elphidium yabei* n. sp. ×25.
Fig. 11.	*Elphidium yezoense* Asano, (Photo.) ×5.

Explanation of Plate 15 (4)

Figs. 1a, b; 2a, b.	*Nonion japonicum* n. sp. ×25.
Figs. 3, 8.	*Nonion manpukujiense* Otuka ×25.
Figs. 4a, b.	*Nonion scaphum* (Fichtel and Moll) ×30.
Figs. 5a, b.	*Nonion boueanum* (d'Orbigny) var. ×25.
Figs. 6a, b	*Nonion subturgidum* (Cushman) ×30.
Figs. 7a, b.	*Nonion* cf. *umbilicatulum* (Montagu) ×30.
Figs. 9a, b.	*Astrononion stelligerum* (d'Orbigny) ×30.
Figs. 10a, b.	*Nonion pompilioides etigoense* n. subsp. ×30.
Figs. 11a—c.	*Pseudononion japonicum* Asano ×40.
Figs. 12a, b.	*Nonionella pulchella* Hada ×50.
Figs. 13a, b.	*Nonion pompilioides* (Fichtel and Moll) ×25.
Fig. 14	*Nonion grateloupi* (d'Orbigny) ×30.

Explanation of Plate 16 (5)

Figs. 1, 15.	*Bolivina hantkeniana* Brady Fig. 1. Recent, off Murotozaki, Sikoku. ×40. Fig. 15. Pliocene of Ioki, Aki-gan, Kôti prefecture. ×30.
Fig. 2.	*Bolivina bradyi* n. sp. Recent, west coast of Kii Peninsula. ×40.
Figs. 3a, b.	*Loxostoma amygdalaeforme iokiense* n. subsp. Pliocene of Ioki, Aki-gun, Kôti prefecture. ×35.
Figs. 4a, b.	*Bolivina pseudodifformis* n. sp. Pliocene of Sanuki-mati, Kimitu-gun, Tiba prefecture. ×40.
Figs. 5a, b.	*Bolivina robusta* Brady Pliocene of Hosoya, Haranotani-mura, Ogasa-gun. Sizuoka prefecture. ×45.
Figs. 6a, b.	*Loxostoma kerrerianum* (Brady)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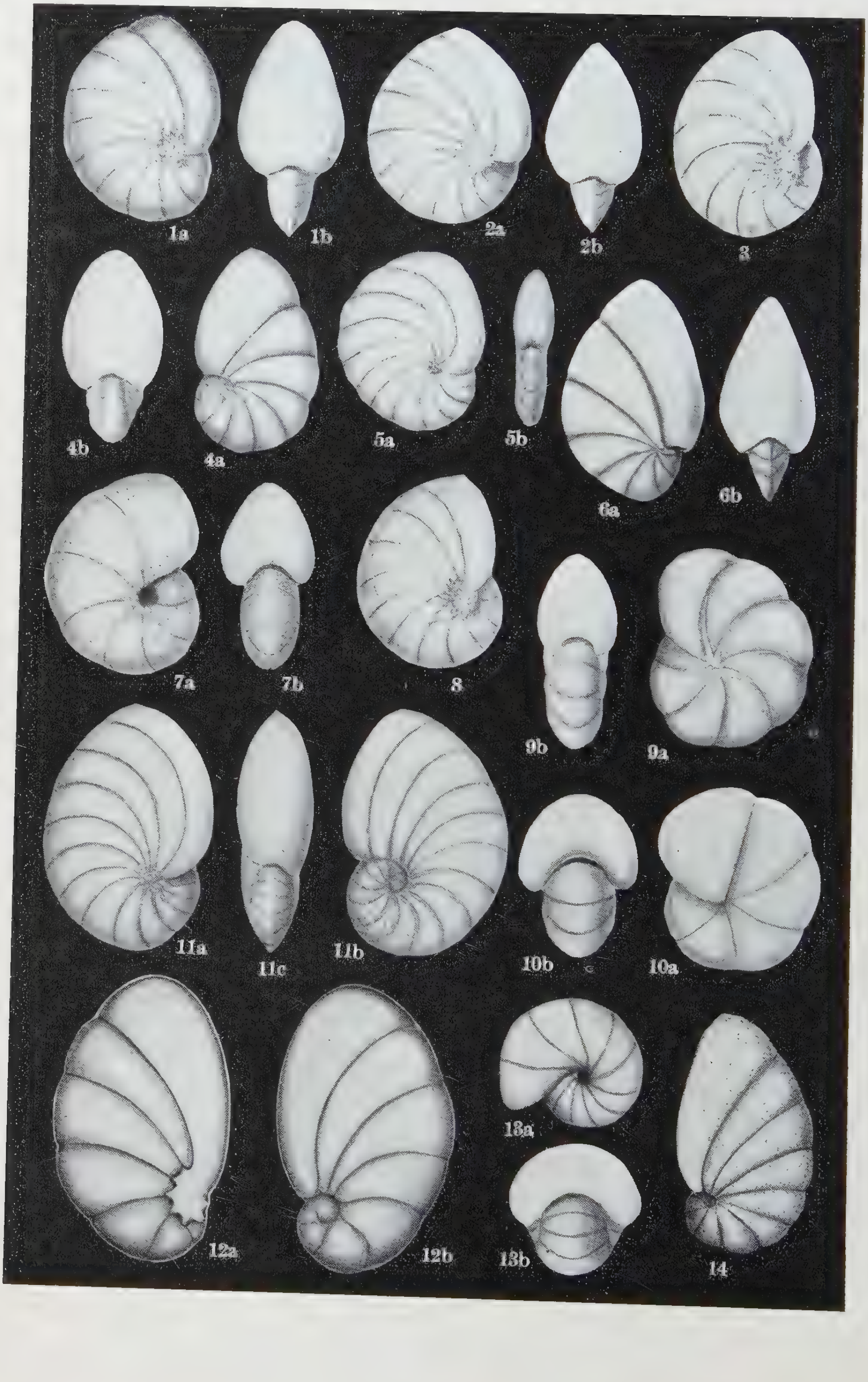
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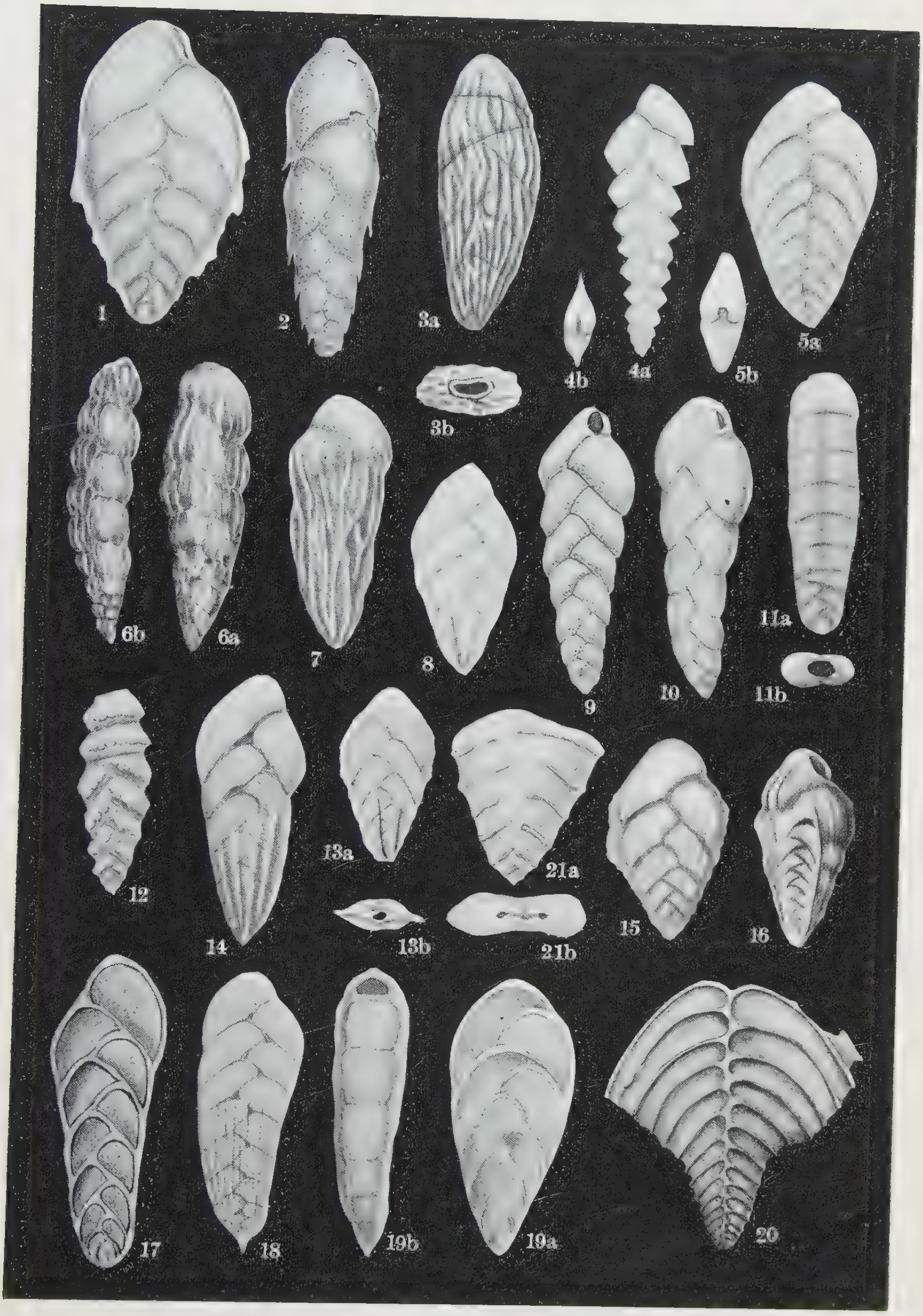
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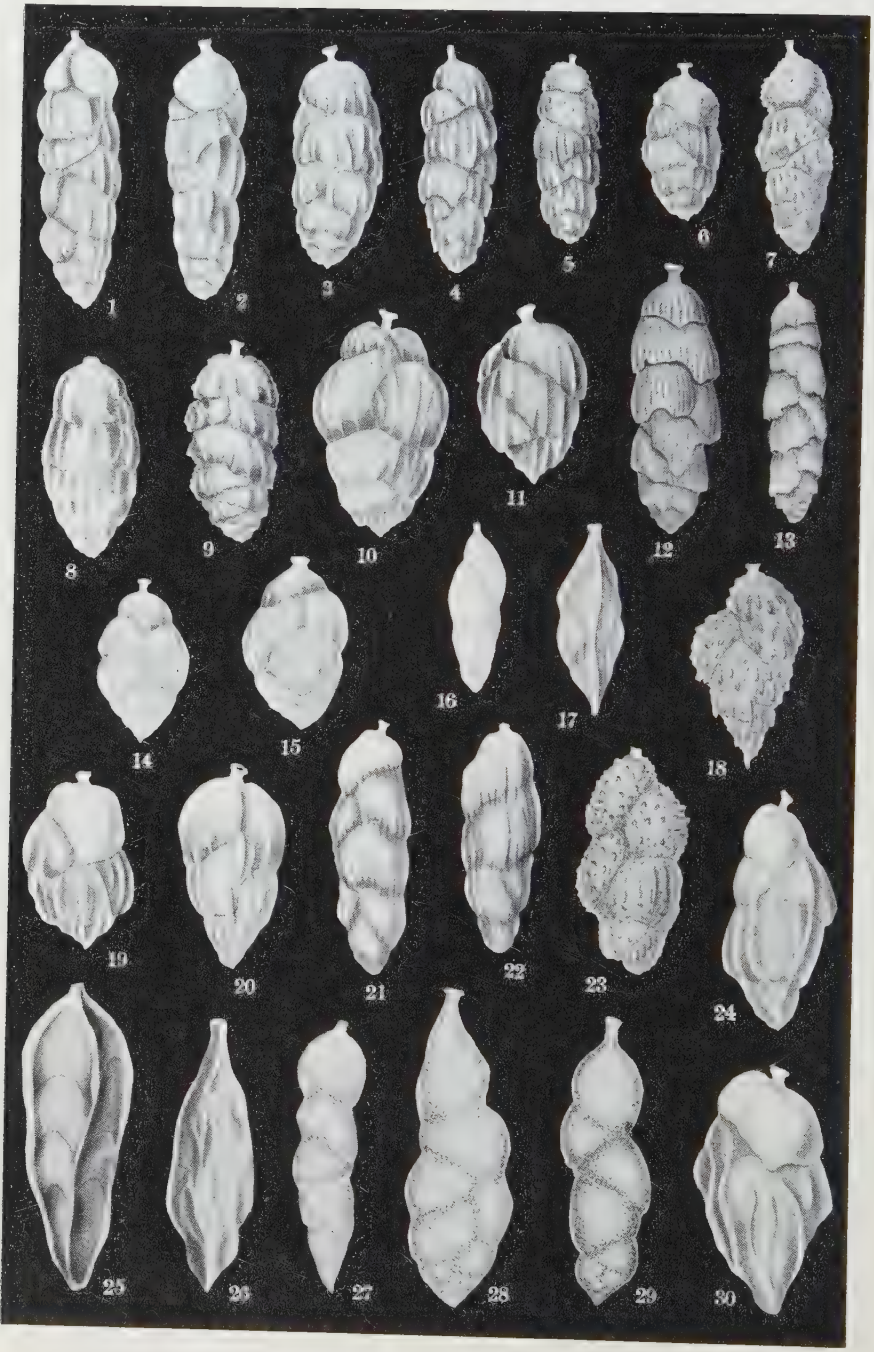
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Pliocene of Muraoka-mura, Kamakura-gun, Kanagawa prefecture. 35.

Fig. 7 *Loxostoma amygdalaeforme* (Brady) ×40.
Recent, Tosa Bay, Sikoku. 40.

Figs. 8, 13a, b. *Bolivina hanzawai* Asano
Fig. 8. Pliocene of Ioki, Aki-gun, Kôti prefecture. ×30.
Fig. 13. Pliocene of Hosoya, Haranotani-mura, Sizuoka prefecture. ×30.

Fig. 9. *Bolivina spinescens* Cushman
Recent, Eastern Japan. ×40.

Fig. 10. *Bolivina seminuda* Cushman
Pliocene of Muraoka-mura, Kamakura-gun, Kanagawa prefecture. ×40.

Figs. 11a, b. *Rectobolivina bifrons* (Brady)
Pliocene of Hosoya, Haranotani-mura, Ogasa-gun, Sizuoka prefecture. ×30.

Fig. 12. *Bifarina japonica* n. sp.
Recent, Kii Channel. ×40.

Fig. 14. *Bolivina aenariensis* (Costa)
Recent, Kii Channel. ×30.

Fig. 16. *Bolivina subangularis ogasaensis* Asano
Pliocene of Hosoya, Haranotani-mura, Ogasa-gun, Sizuoka prefecture. ×25.

Fig. 17. *Bolivinita quadrilatera* (Schwager)
Recent, off Murotozaki, Sikoku. ×45.

Fig. 18. *Bolivina striatula* Cushman
Recent, Eastern Japan. ×35.

Figs. 19a, b. *Bolivinita quadrilatera cuneata* n. subsp.
Pliocene of Muraoka-mura, Kamakura-gun, Kanagawa prefecture. ×45.

Fig. 20. *Bolivinella folium* (Parker and Jones)
Recent, off Murotozaki, Sikoku. ×50.

Figs. 21a, b. *Geminaricta pacifica* n. sp.
Recent, Toyama Bay, Japan Sea. ×40.

Explanation of Plate 17 (6)

Figs. 1, 2. *Uvigerina yabei* n. sp.
Wakimoto, Oga Peninsula, Akita prefecture. ×20.

Figs. 3, 4, 9. (?) *Uvigerina* cf. *bifurcata* d'Orbigny
Wakimoto, Oga Peninsula, Akita prefecture. 20.

Figs. 5, 6, 7. (?) *Uvigerina pygmaea* d'Orbigny
Wakimoto, Oga Peninsula, Akita prefecture. ×20.

Figs. 8, 10, 11, 14, 15. *Uvigerina mediterranea* Hofker
Fig. 8. Muraoka-mura: Kanagawa prefecture ×20.
Figs. 10, 11. Osikiri, Hôngô-mura, Kanagawa prefecture. ×20.
Figs. 14, 15. Ketienzi, Nangô-mura, Sizuoka prefecture. 20.

Figs. 12, 13. *Uvigerina tenuistriata* Reuss.
Muraoka-mura, Kanagawa prefecture. 20.

Fig. 16. *Uvigerina* sp.
Wakasa Bay, Japan Sea, 190 meters. ×20.

Fig. 17. *Angulogerina japonica* n. sp.
Wakasa Bay, Japan Sea. 190 meters. ×30.

Fig. 18. *Uvigerina* cf. *peregrina* Cushman.
Wakimoto, Oga Peninsula, Akita prefecture. 20.

Figs. 19, 20, 24, 30. *Uvigerina schwageri* Brady
Figs. 19, 20. Hosoya, Haranotani-mura, Sizuoka prefecture. ×20.
Figs. 24, 30. Hiroseitiba, Kokubunzi-mura, Tiba prefecture. ×20.

Figs. 21, 22. *Uvigerina substriata* n. sp.

	Fig. 20. Sanuki-mati, Kimitu-gun, Tiba prefecture. ×20.
	Fig. 22. Kamo, Toyota-mura, Awa-gun, Tiba prefecture. ×20.
Fig. 23.	*Uvigerina aculeata* d'ORBIGNY Hiroseitiba, Kokubunzi-mura, Tiba prefecture. ×20.
Fig. 25.	*Trifarina bradyi* CUSHMAN Sôyô-maru station 485, Japan Sea, 93 meters. ×20.
Fig. 26.	*Angulogerina* sp. Sôya-maru station 352, west coast of Kii Peninsula, 154 meters. ×30.
Fig. 27.	*Uvigerina* sp. Ditto. ×40.
Figs. 28, 29.	*Uvigerina pseudoampullacea* n. sp. Fig. 28 Sôyô-maru station 345, near Muroto-zaki, Sikoku, 119 m. ×40. Fig. 29. Sôyô-maru station 297, near Tanegasima, 516 meters. ×40.

68. 仙臺附近産化石植物に就いて (I)

遠藤誠道

(昭和 13 年 2 月 12 日講演, 2 月 12 日受理)

仙臺附近に發達する新第三紀層群中に可なり多量に化石植物を產する地層がある。其一は筆者が嘗て報告した1) 宮城縣宮城郡根の白石村字福岡なる根の白石含化石植物層で，これより其後保存良好なる化石植物を多量に採集した。此根の白石含化石植物層と同時代と見られる含化石植物層に，宮城縣宮城郡大澤村奧武士，及び同村白澤 同縣名取郡秋保村西澤及び同村白坂峠等がある。

筆者は奧津春生學士の援助によつて是等の各地層から採集した材料を整理して 37 屬 52 種（第 1 表參照)を檢出することが出來た。(是等の中若干は奧津春生學士が近く詳細に記載して發表することになつて居る）

此第 1 表中日本群島(臺灣をのぞく)に現生しないものが 7 屬(約 19%), 13 種（約 25%)認められる。更に此化石植物群の產地附近なる本州東北地方に現生しないものが 3 屬（*Cinnamomum, Tetradenia, Ficus*). 3 種 (*Ficus* sp., *Cinnamomum camphora, Tetradenia glauca*) あるので前者と合せて 10 屬（約 27%), 16 種（約 30%）は我が本州東北地方に見られないものである。

是等日本群島に於ける絕滅種のうち,

Glyptostrobus europaeus HEER2)
Sequoia sempervirens ENDL3).
Liriodendron honsyuensis ENDÔ4)
Sassafras yabei ENDÔ et OKUTSU5)

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1) 遠藤誠道: 新生代の化石植物（岩波講座). P. 20, 1931.

2) ENDÔ, S. and OKUTSU, H.: *Glyptostrobus* Cone from the *Liriodendron* Bed near Sendai. Proc. Imp. Acad. Tôkyô. XII, pp. 138-140, Figs. 1-3, 1936.

3) ENDÔ, S.: A Neogene Species of *Sequoia* from Japan. Bot. Gazette. XCIV. pp. 605-610, Figs. 1-13, 1933; New Fossil Species of *Sequoia* from the Far-East. Proc. Imp. Acad. Tôkyô, XII, pp. 172-175, Figs. 1-13, 1936.

4) ENDÔ, S.: Discovery of *Liriodendron* Leaves from the Neogene of Japan. Proc. Imp. Acad. Tôkyô, X, pp. 590-593, Figs. 1, 2, 1934.

5) ENDÔ, S. and OKUTSU, H.: A Neogene Species of *Sassafras* from Japan. Proc. Imp. Acad. Tôkyô, XII, pp. 47-49, Figs. 1-4, 1936.

の 4 屬 4 種に就いては既に報告したから其他のものについて少しく述べて見たいと思ふ。

Taxodium は北亞米利加の東部及びメキシコに現生するもので化石としては廣く北半球の第三紀層から報告され，我國に於ても古第三紀の火炭層に多く產するものであるが新第三紀層產としては仙臺附近の他に神戶，白川峠から保存良好なものが採集されて居る。

Catalpa は北亞米利加東部及び支那に現生する屬であるが我國に於ては現在庭木として廣く栽培されて居るにすぎない。仙臺附近から出た化石は支那現生種に同定された。

Firmiana platanifolia は臺灣に現生するもので我國各地に庭木として栽培されて居る最も普通の樹木である。化石としては今回が最初の報告である。

Ilex cornuta は特有な形の葉を有するもので我が濟州島及び支那に現生する興味ある種で，三木理學士が之を兵庫縣の明石附近から始めて報告した。[6] 仙臺附近は其第 2 の化石產地である。*Acer truncatum* 及び *Acer francheti* は共に支那現生種で，*Fagus ferruginea* は北亞米利加の東部地方に繁茂する *Fagus americana* に近似である。

Populus balsamoides と *Ficus ruminiana* とは共に歐羅巴の中新世から記載された化石種で前者は歐の中新世に最も普通に產するが，我國では宮城縣伊具郡北鄉村字江尻より發見されたものと此仙臺附近產と合せて 2 箇所しか知られて居ない，此近似種は北亞米利加の北部とシベリア地方に現生する *Populus balsamifera* L. である。*Ficus ruminiana* は Oswald HEER 教授が Schweiz の

Osmunda sp.
* *Glyptostrobus europaeus* HEER
* *Sequoia sempervirens* ENDL.
* *Taxodium distichum* RICH.
Taxus cuspidata S. et Z.
Thuja japonica MEXIM.
Acer diabolicum BL.
A. pictum THUNB.
A. rufinerve S. et Z.
A. eupalmatum KOIDZ.
† *A. truncatum* Bunge
† *A. francheti* PAX.
A. sieboldianum MIQ.
Alnus firma S. et Z. var. *sieboldiana* WINKLE
A. maxlmowiczii CALL.
A. hirsuta TURCZ.
Betula japonica SIEB.
B. maximowicziana REGEL
B. ermanni CHAM.
Castanea crenata BL.
* *Catalpa ovata* G. DON.
Celtis sp.
Clethra barbinervis S. et Z.
Cinnamomum camphora NEES. et EBERM.
Fagus sp.
F. crenata BL.
† *Fagus ferrugines* AIT.
† *Ficus ruminiana* HEER
F. sp.
* *Firmiana platanifolia* SCHOTT et ENDL.
* *Liriodendron honsyuensis* ENDÔ
† *Ilex cornuta* LINDLEY et PAXTON
Juglans sp.
Hydrangea sp.
Kalopanax ricinifolium MIQ.
Meliosma sp.
Magnolia sp.
Ostrya japonica SARG.
Pirus sinensis L.
† *Populus balsamoides* GAEPP.
Prunus ssiori FR. SCHM.
Quercus sp.
Q. crispula BL.
Q. glauca THUNB.
* *Sassafras yabei* ENDÔ et OKUTSU
Sapium japonicum PAX et K. HOFFM.
Stewartia pseudocamellia MAXIM.
Tetradenia glauca MATSUM.
Ulmus japonica SARG.
Vitis sp.
Viburnum furcatum BL.
Zelkowa serrata MAKINO

Table I. List of the Fossil Flora found in the Nenosiraishi Plant bed etc.
{* (Genera) † (Species) extinct in Japanese Island, except Taiwan.}

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6) MIKI, S.: Plant fossils from the *Stegodon* Beds and the *Elephas* Beds near Akashi. Jap. Jour. Bot. Tôkyô, VIII, pp. 320-322, pl. IX, B. D, Fig. 7, F-H, 1937.

第三紀(中新世)から始めて記載した種[7]である。

次に此根の白石化石植物群の指示する地質時代を按ずるに是等含化石植物層群を不整合に被覆す。る下部埋木層及び龍ノ口介殼化石層の地質時代と此含化石植物層群の下に位する鹽釜化石植物層群産植物群及び動物群とが指示する地質時代とを合せ考へて，上部中新世を指示するものと見られる

On Fossil Plants from the Environs of Sendai (I).

(Résumè)

By

Seidô Endô

In the present article is treated a Neogene flora of the Nenosiraisi plant bed. The plant bed is one of the prolific plant bearing deposits hitherto found in the environs of Sendai, its type locality being Nenosiraisi, about 12 km. NW. of the City; the plant bed seems to occupy a considerable area around the type locality.

The material were collected by Mr. H. Okutsu and the writer during the several years past from the type horizon and from some others thought to be almost contemporaneous with it.

The plant species discriminated of the material are listed. The flora consists of 52 species in 37 genera, and has 7 genera (about 19% of the whole) and 13 species (about 25% of the whole) exotic to the present flora of the islands of Japan proper. Some of them, however, are now living in Taiwan. Furthermore, 10 genera (about 27% of the whole) and 16 species (30% of the whole) are no more living in northern Honsyû. The plant bed is Upper Miocene in age, judged on the mammalian and molluscan remains found in the underlying Siogama and overlying Tatunokuti group.

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[7] **Heer**, O.: Die tertiäre Flora de Schweiz. III, p. 183, pl. CLII, Figs. 11, 12, 1859.

69. *Neogene Shells from the Vicinity of the City of Takasaki, Gumma-ken, Japan*

By

Tuneteru OINOMIKADO

(Read February 12th; received March 26th, 1938)

At the 6 th. Ordinary Meeting of the Palaeontological Society of Japan (1937), the occurrence of Neogene mollusks from the Tomioka-Simonita district, Gumma-ken was reported by Mr. K. Suzuki. In 1938, Dr. Huzimoto and Mr. Kobayasi[1] described the geology of the district, and according to them the geological sequence of the Neogene deposits is as follows (in descending order).

1. Akima bed: Conglomerate, agglomerate, and lava flow.
2. Itahana bed: Alternation of sandstone, shale and conglomerate; lignite beds containing plant leaves at the upper.
3. Tomioka bed: Alternation of sandstone and shale, and conglomerate.
4. Usibuse bed: Sandstone.
5. Kanohara bed: Conglomerate.

Dr. Huzimoto and Mr. Kobayasi collected *Lepidocyclina* and *Miogypsina* from the Tomioka bed and many mollusks from the Itahana bed. They cancluded that the age of the Tomioka bed is referred to Miocene, and the Itahana bed, which unconformably covers the Tomioka bed, is Pliocene in age.

The writer collected some interesting species of Mollusca from the Itahana bed. The distinguished forms are as follows:

	1	2	3
PELECYPODA			
Nuculana confusa (Hanley)	—	—	R
● *Anadara ogawai* Makiyama	—	R	—
Limopsis sp.	—	R	—
● *Glycymeris k-suzukii* n. sp.	F	F	—
Mytilus sp.	—	R	
● *Chlamys kaneharai* (Yokoyama)	—	F	—
Chlamys sp.		R	R

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[1] Huzimoto and Kobayasi: Jour. Geol. Soc. Japan, Vol. 45, No. 533, pp. 205-226, 1938.

	1	2	3
Crassatellites suyamensis n. sp.	—	F	—
Cardita (*Miodontiscus*) *nakamurai annakaensis* n. subsp.	—	—	F
Venericardia sp.	—	R	—
● *Diplodonta* (*Felaniella*) *usta* Gould	—	R	—
● *Cardium* (*Trachycardium*) *shiobarense* Yokoyama	—	R	—
Cardium (*Cerastoderma*) sp.	R	R	R
● *Cardium* (*Nemocardium*) *samarangae* Makiyama	—	F	F
● *Venus* (*Mercenaria*) *yokoyamai* Makiyama	—	F	—
Mactra (*Mactromeris*) *polynyma voyi* (Gabb)	—	F	—
● *Macoma tokyoensis* Makiyama	—	—	R
● *Aloidis venusta* (Gould)	—	R	—
Thracia higasinodonoensis n. sp.	R		—
GASTROPODA			
● *Solariella sakya* Yokoyama	—	R	R
Turcicula argenteonitens (Lischke)	—	—	R
● *Turritella kadonosawensis* Otuka	—	—	F
Actaeopyramis eximia (Lischke)?	—	—	R
Capulus sp.	—	—	R
Crepidula sp.	—	—	R
● *Natica* (*Tectonatica*) *janthostoma* Deshayes	—	F	F
● *Natica* (*Neverita*) *didyma* Bolten	—	—	F
● *Bursa yabei* Nomura et Hatai	—	—	R
● *Phos* (*Coraeophos*) *iwakianus* (Yokoyama)	—	—	F
● *Olivella iwakiensis* Nomura et Hatai	—	—	F
Olivella consobrina (Lischke)	—	—	R
Fulgoraria (*Psephaea*) *prevostiana* (Crosse)	—	R	—
● *Cancellaria hukusimana* Nomura et Hatai	—	—	R
● *Surculites* (*Megasurcula*) *yokoyamai* Otuka	—	R	—
Cylichna kôzukensis n. sp.	—	—	R

(R....rare; F....frequent)

Loc. 1. Higasinodono, Iwanoya-mura, Usui-gun.
Loc. 2. Suyama, Iwanoya-mura, Usui-gun.
Loc. 3. Annaka-mati, Usui-gun.

It is interesting that there are many common species between the fossil fauna of the Itahana bed and that of the shell beds of Tanagura, Hukusima-ken, described by Dr. Yokoyama[1] and Messrs. Nomura and Hatai[2]. The geological age of the Tanagura Beds is considered by the latter authors as the Middle Miocene. The molluscan fauna of the Itahana bed is also related to that of the Kadonosawa series in Iwate-ken. Now Messrs. Omura, Sawatari, and Sato of the Nippon Oil Company are studying the geology of the above titled region. After the completion of their geological survey, the age of the Itahana bed will be discussed.

The type specimens of *Glycymeris k-suzukii* n. sp. collected by Mr. Murakosi are preserved in the Geological Institute, Faculty of Science, Imperial University of Tokyo. The other specimens described in this paper were presented by the

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● Common species between the Tanagura Beds and the Itahana bed.

1) Yokoyama: Jour. Fac. Sci. Imp. Univ. Tokyo, Sec. 2, Vol. 3, Pt. 4, pp. 197-203, 1931.

2) Nomura and Hatai: Saitô Hô-on Kai Mus., Res. Bull., No. 10, pp. 109-155, 1936.

Nippon Oil Company to the Imperial Geological Survey of Japan.

Description of the Species

Glycymeris k-suzukii n. sp.

Pl. 20 (7), figs. 1, 2, 3.

Shell fairly large, thick and solid, suborbicular in outline, somewhat longer than high, greatly inflated, nearly equilateral. Anterior and posterior ends rounded; antero and postero-dorsal margins decending, slightly convex; ventral margin regularly arcuated. Beak rather swollen, prominent, located almost at the center of the dorsal border. Surface ornamented with many radiating impressed lines crossed by concentric growth lines which are numerous and irregular. Interior of the type specimen unknown. Interior of paratype: Ligamental area rather broadly triangular, equilateral, flattened, transversely finely striated. Cardinal plate large and thick, the upper margin nearly straight, the lower one broadly curved, obtusely angulated at the middle. Teeth about 10 on each side. Inner surface with faintly radiating striae. Muscular impression distict, thickened.

Holotype (in Geol. Inst. Fac. Sci. Imp. Univ. Tokyo.) 73.4 mm long; 63.3 mm high; 29.1 mm thick.

Occurrence: Hatonosukake, Iwadaira-mura, Kita-kanra-gun (type locality); Namerisawa, Annaka-mati, Usui-gun; Higasinodono, Iwanoya-mura, Usui-gun; Suyama, Iwanoya-mura, Usui-gun.

This species is closely allied to *G. cisshuensis* Makiyama[1], but it differs from that species in that the shell is more equilateral, more inflated, the beak is larger and more swollen. *G. k-suzukii* also resembles *G. nakamurai* Makiyama[2] and *G. oinouyei* Nomura[3]. Compared with *G. nakamurai*, the new species has a more convex shell with larger beak, more numerous radiating striae on the surface, and broader ligamental area. It also differs from *G. oinouyei* in having a more dilated shell with more swollen beak. The present new species has the most convex shell as seen in the following table.

	Length	Height	Thickness	
G. cisshuensis	67 mm	62 mm	22 mm	(3 : 2.8 : 1)
G. nakamurai	78	71	26	(3 : 2.7 : 1)
G. oinouyei	61.5	51.5	22.5	(2.7 : 2.3 : 1)
	62	61.7	19	(3.2 : 3.2 : 1)
G. k-suzukii	73.4	63.3	29.1	(2.5 : 2.2 : 1)

The new species differs from *G. imperialis* Kuroda[4], a living species of Japan, in that the shell is much larger and longer. *G. k-suzukii* is easily distinguished from *G. albolineata* (Lischke)[5], a common recent species, in being more circular in outline and in possessing a more inflated shell.

The specimen from the Tanagura Beds, which was referred to *G. albolineata* by Dr. Yokoyama[6], is probably the present species. It was dedicated to Mr. K.

---

1) Makiyama: Mem. Coll. Sci. Kyoto Imp. Univ., Ser. B, Vol. 2, No. 3, p. 155, pl. 13, f. 3, 3, 1926

2) Makiyama: Op. cit., Vol. 3, No. 1, p. 30, pl. 1, f. 5, 6, 1927.

3) Nomura: Op. cit., No. 5, p. 74, pl. 3, f. 1, 1935.

4) Kuroda: Venus, Vol. 4, No. 4, p. 201, pl. 4, 1934.

5) Lischke: Jap. Meer. Conch., Vol. 3, p. 108, pl. 9, f. 11, 12, 1874.

6) Yokoyama: Op. cit., Sec. 2, Vol. 3, pt. 4, p. 199, 1931.

SUZUKI, who first reported at the meeting of the Palaeontological Society of Japan (1937) that the *Glycymeris* from Hatonosukake, Iwadaira-mura is new to science, but he did not give any descriptions.

Crassatellites suyamensis n. sp.

Pl. 20 (7), figs 9, 10.

Shell small, trigonal, somewhat longer than high. Anterior end rounded; posterior end obtusely truncated. Antero-dorsal margin straight, sloping, even slightly excavated near the beak. Postero-dorsal margin somewhat convex. Ventral margin broadly arcuated, finely crenated. Posterior ridge obsolete. Sculpture consisting of many, concentric rounded ribs, obsolete on the postero-dorsal border. Beak small, pointed, slightly inclined forward. Lunule distinct, longly ovate. Escucheon lanceolate, longer than the lunule.

Measurement:

	Length	Height	Thickness
Holotype (in Imp. Geol. Surv. Japan)	18.5 mm	15.6 mm	4.7 mm
Paratype	18.1	14.8	unknown

Occurrence: Suyama, Iwanoya-mura, Usui-gun.

This species resembles *C. nanus* (ADAMS et REEVE)[1], a species found in the Japanese waters. It differs from the latter species by its more steeply sloping convex postero-dorsal margin, and less arched ventral margin. *C. pauxila* (YOKOYAMA)[2] from the Neogene deposits of Titibu is an allied species. But this new species has a more acute apical angle and finer concentric ribs.

Cardita (*Miodontiscus*) *nakamurai annakensis* n. subsp.

Pl. 20 (7), figs. 7, 8.

The shell is closely allied to *C. nakamurai* (YOKOYAMA)[3] but differs in its more numerous rediating ribs. The species has ten to twelve ribs, while the ribs of the subspecies are fourteen to sixteen in number.

Measurement:

	Length	Height	Thickness
Holotype (in Imp. Geol. Surve. Japan)	4.2 mm	4.8 mm	1.6 mm
Paratype No. 1.	3.7	3.7	1.2
Paratype No. 2.	4.0	4.5	unknown

Occurrence: Annaka-mati, Usui-gun.

The species is closely allied to *C. prolongata* (CARPENTER)[4]. In a former paper[5] the writer combined them into a single species. Dr. SCHENCK has examined the specimens of *C. nakamurai* (YOKOYAMA), which were forwarded by Mr. OTUKA, and answered him as follows "Comparison of *Miodontiscus prolongata* and '*Venericardia*' *nakamurai* shows them to be congeneric but not conspecific".

Thracia higasinodonoensis n. sp.

Pl. 20 (7), figs. 11, 12.

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[1] ADAMS and REEVE: Voy. Samarang Moll., p. 81, pl. 23, f. 2, 1850.

[2] YOKOYAMA: Op. cit., Sec. 2, Vol. 1, Pt. 3, p. 122, pl. 15, f. 8–11, 1925.

[3] YOKOYAMA: Jour. Coll. Sci. Imp. Univ. Tokyo, Vol. 44, Art. 7, p. 5, pl. 1, f. 9, 1923.

[4] CARPENTER: Brit. Assn. Adv. Sci., Rept. for 1863, p. 642, 1864.

[5] OINOMIKADO: Jour. Geol. Soc. Japan, Vol.44, No. 520, p. 66, 1937.

Shell rather small, ovately transverse, swollen in the central and umbonal area, compressed in the postero-dorsal area, rounded in front, and truncated behind. Antero-dorsal margin nearly convex; postero-dorsal margin straight and horizontal. Anterior end broad, rounded; posterior end truncated, narrower than the anterior. Ventral margin broadly arched, rounded in front, sloping straight along the posterior border, slightly excavated near the postero-ventral corner. Surface sculptured with irregular concentric growth lines. Posterior ridge oblique, rather distinct. Beak not prominent, located near the middle of the shell length.

Measurement:

	Length	Height	Thickness	(Both valves closed)
Holotype (in Imp. Geol. Surv. Japan)	26.9mm	16.3mm	9.1mm	

Occurrence: Higasinodono, Iwanoya-mura, Usui-gun.

This species resembles *T. concina* Gould[1] (=*T. papyracea* of Yokoyama)[2], but differs from that species in that the shell is higher; the ventral margin is more arched; the surface behind the posterior ridge is more depressed in the middle; the postero-ventral angle more acute. *T. beringi* Dall[3] (=*Telline kakumana* Yokoyama)[4] is also an allied species. But Dall's species has a larger shell and more steeply sloping dorsal margin. *T. pertrapezoides* Nomura[5] is a shell closely allied to this new species. But the former has a larger shell, more prominent beak, and less oblique posterior ridge.

Cylichna kôzukensis n. sp.

Pl. 20 (7), figs. 4, 5, 6.

Shell rather large for the Genus, thin, cylindrical, convolute, tapering at both ends, broadest at one-third of the length from the anterior end; posterior end truncated, anterior end rounded; surface with obtuse lines of growth and fine impressed transverse striations, the latter more distinct near the upper and lower ends and a fine interstrial line lying between the striations near the anterior end; aperture as long as the shell-height, narrowed in the posterior portion, dilated in the anterior; outer lip thin.

Measurement:

	Height	Diameter
Holotype (in Imp. Geol. Surv. Japan)	17.4 mm;	7.7 mm

Maximum diameter of aperture
5.8 mm
Diameter of aperture at apical portion
2 mm

Occurrence: Annaka-mati, Usui-gun.

C. musashiensis Tokunaga[6] is an allied allied apecies. But the new species is easily distinguished by its surface sculpture and more dilated aperture. In the sculpture the present species resembles *C. copulenta* Yokoyama[7], but it differs from the latter in that the shell is slender, and the aperture is less dilated in front.

---

[1] Gould: Otia Conch., p. 161.

[2] Yokoyama: Op. cit., Vol. 44, Art. 1, p. 171, pl. 14, f. 12, 1922.

[3] Dall: Proc. U.S. Nat. Mus., Vol. 49, p. 442, 1915.

[4] Yokoyama: Op. cit., Sec. 2, Vol. 2, Pt. 4, p. 177, pl. 67, f. 14, 1927.

[5] Nomura: Op. cit., No. 6, p. 50, pl. 7, f. 4, 1935.

[6] Tokunaga: Jour. Coll. Sci. Imp. Univ. Tokyo, Vol. 21, Art. 2, 32, pl. 2, f. 12, 1906.

[7] Yokoyama: Op. cit., Sec. 2, Vol. 1, Pt. 7, p. 217, pl. 28, f. 3, 1926.

Explanation of Plate 20 (7)

Fig. 1. *Glycymeris k-suzukii* n. sp. Specimen from Namerisawa, Annaka-mati, Usui-gun, Gumma-ken. (×1).
Figs. 2, 3. Ditto. (Holotype). (×1).
Figs. 4, 5, 6. *Cylichna kôzukensis* n. sp. (Holotype). (×1.5).
Figs. 7, 8. *Cardita (Miodontiscus) nakamurai annakensis* n. subsp. (Holotype) (×3)
Figs. 9, 10. *Crassatellites suyamensis* n. sp. (Holotype) (×1.5).
Figs. 11, 12. *Thracia higasinodonoensis* n. sp. (Holotype) (×1.5)

群馬縣高崎市附近の新第三紀貝化石 (摘要)

大炊御門經輝

日本古生物學會第6回例會に於て鈴木好一學士に依り群馬縣下仁田，富岡町附近の新第三紀貝化石が報告された。同地方の地質に關しては藤本治義博士及び小林學氏の研究がある。此處に記載した貝化石は藤本，小林兩氏の板鼻層のもので，板鼻層の化石フォーナは福島縣棚倉町附近の新第三紀貝化石群と著しく類似し，又一方岩手縣の門ノ澤統のものとも關係がある。目下日本石油會社の大村一藏學士，佐渡道隆學士，佐藤彬學士が本地方の地質に就き研究中で，地質時代に就いては上記諸氏の研究が完成する迄保留する。

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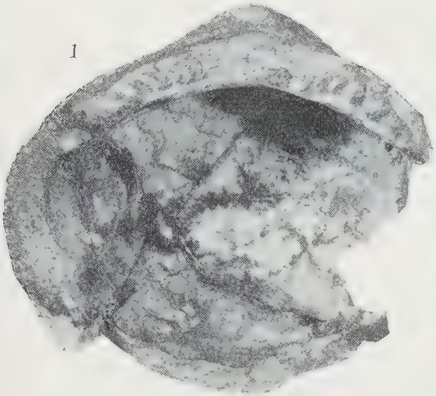

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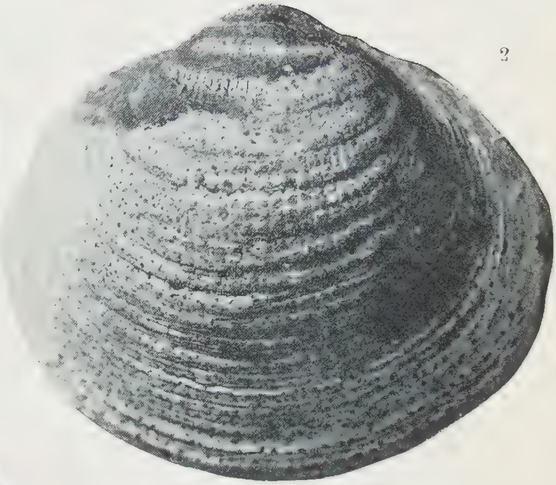

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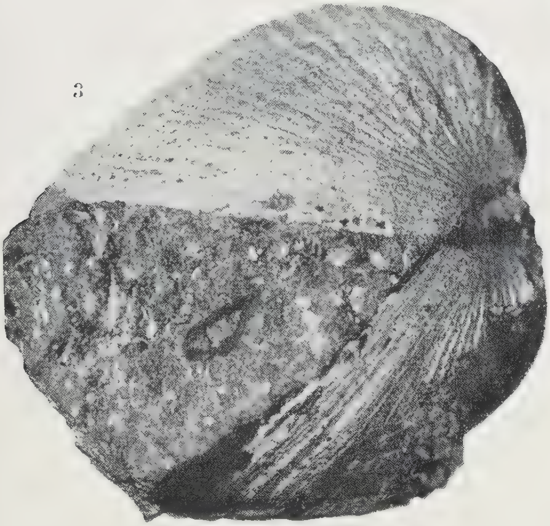

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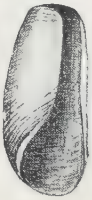

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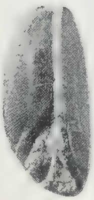

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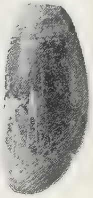

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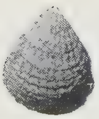

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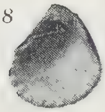

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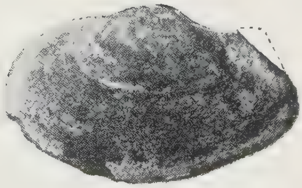

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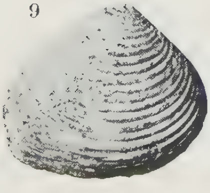

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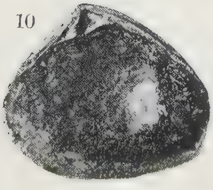

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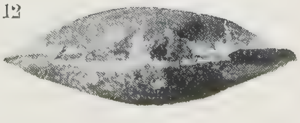

70. *A New Species of Calyptogena from the Higasiyama Oil Field, Niigata-ken, Japan**

By

Tuneteru OINOMIKADO and Kinji KANEHARA

(Received May 27th; read June 11th, 1938)

In 1937, one of the present writers (OINOMIKADO) made a large collection of fossil shells from the Usigakubi bed of the Higasiyama Oil Field, Niigata-ken. Some specimens of a peculiar shaped vivalve, *Calyptogena nipponica* n. sp. have been founded among the fossil fauna. In the same year, the another writer (KANEHARA) visited the oil field, and obtained two specimens of this new species from a water well sunk into the black shale of the Kubiki series at Nakanosawa, Higasiyama-mura, Niigata-ken.

There are three known species of the genus *Calyptogena*, including *C. nipponica*, which seems to be extinct. *C. pacifica* DALL[1] is living in the Clarence Strait, Alaska to the Santa Barbara Channel, California, and is also known as a fossil from the Pliocene of California. Recently it was reported by OTUKA[2] from the Pliocene of the Oga Peninsula, Akita-ken, Japan. *C. elongata* DALL[3] is another representative of the genus, and now living in the waters of Santa Barbara Islands to San Diego, California.

The specimens from the Usigakubi bed were contributed to the Imperial Geological Survey of Japan from the Nippon Oil Company.

Genus *Calyptogena* DALL, 1891

Type (by monotype), *Calyptogena pacifica* DALL, Proc. U. S. Nat. Mus., Vol. 14, p. 190, 1891.

Calyptogena nipponica n. sp.

Holotype: A both valves closed specimen from the Usigakubi bed (Pliocene); preserved in the Imperial Geological Survey of Japan.

Description: Shell moderately large, rather solid, transversely elongate, strongly inequilateral. Beaks low, tumid, situated about one-third or one-forth of the length from the anterior end. Anterior end rounded; posterior end more broadly rounded. Antero-dorsal margin short, slightly excavated in front of the beaks; postero-dorsal margin long, gently arcuate. Ventral margin nearly straight, somewhat concave near the middle. Surface sculptured with concentric incremental lines, slightly depressed near the center of the ventral portion. No lunule. Ligament long and strong. Escutcheon lanceolate, bounded by elevated ridges, long, extending to the half of the postero-dorsal margin. Hinge normal.

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* By the permission of Dr. S. YAMANE, Director of the Imperial Geological Survey of Japan.

1) Proc. U. S. Nat. Mus., Vol. 14, p. 190, 1891.

2) Jour. Geol. Soc. Japan, Vol. 44, No. 522, p. 231, 1937.

3) Proc. U. S. Nat. Mus., Vol. 52, p. 408, 1916.

Dimentions:	Height	Length	Thickness
Holotype.	46.1mm	115.4mm	15mm (one valve)

Comparisons: At first sight this shell resembles somewhat *Trapizium japonicum* Pilsbry,1) but the escutcheon and the hinge are entirely different. The new species is distinguished from *Calyptogena pacifica* Dall by a larger and more elongate shell. *C. nipponica* is closely allied to *C. elongata* Dall, but differs from tnat species in that the shell is very much larger and more solid; the anterior end is narrower; and the surface of the ventral portion somewhat depressed. *Paphia hachiyai* Nomura2) of the Miocene of the Nisi-Tugaru District, Aomori-ken, is also an allied species. But Nomura's species has a higher shell and broadly arched ventral border.

Type locality: Usigakubi bed (Lower Pliocene). In a gray shale, on the eastern bank of the Mae-kawa, about 1.2 km. south of the village office of Nisitani-mura at Nakamura, Nisitani-mura, Kosi-gun, Niigata-ken.

Remarks: The occurrence of the species in the type locality is not rare, As already stated, Kanehara obtained this species from the Kubiki series (Miocene). Mituti, geologist of the Imperial Geological Survey, colleted this *Calyptogena* from his Katsuura Beds (Upper Miocene or Lower Pliocene) in the Bôsô Peninsula. The geological range of the new species, hithrto known, is Miocene-Pliocene.

Explanation of Plate 21 (8)

Calyptogena nipponica n. sp.

Fig. 1.	Holotype. (×5/7)
Fig. 2.	Ditto, dorsal view. (×5/7)
Figs. 3, 4.	Specimens from Nakanosawa, Higasiyama-mura, Niigata-ken. (×1)
Fig. 5.	Paratype. (×6/7)

新潟縣東山油田産 *Calyptogena* の1新種 （摘 要）

大炊御門經輝, 金原均二

二枚貝 *Calyptogena* 屬に Dall (1891) に依り創設され, 模式種は *C. pacifica* Dall である。本種は現在 Alaska から California に分布し, 亦化石は California の鮮新統から知られ, 我國からも最近大塚學士に依り秋田縣男鹿半島の鮮新統から報告された。大炊御門は東山油田に發達する牛ケ首層より *Calyptogena* の新種 *C. nipponica* を採集したが, 金原は古志郡東山村中澤の小學校庭に掘られた井戸（飲料水用）から採集された本種の標本を得た。此の小學校附近には寺泊層が發達し, 化石は地表下 62 尺の處から採れた。模式標本には保存の良い牛ケ首層産のものを選定した。*C. nipponica* の地質時代は今日迄知られてゐる處では中新世上部から鮮新世下部である。

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1) Proc. Acd. Nat. Sci. Phila., Vol. 57, p. 119, pl. 5, f. 34-36, 1905.

2) Saito Ho-on Kai Mus. Res. Bull., No. 6, p. 55, pl. 3, f. 5, 6, 1935.

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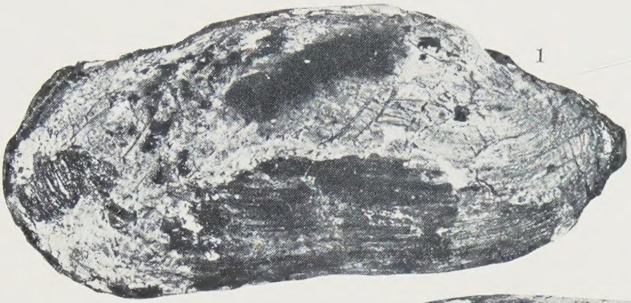

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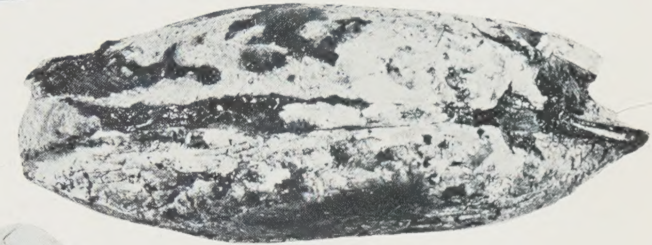

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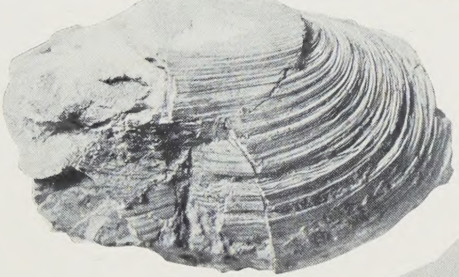

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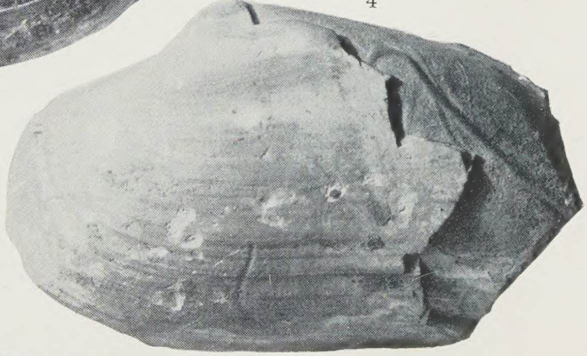

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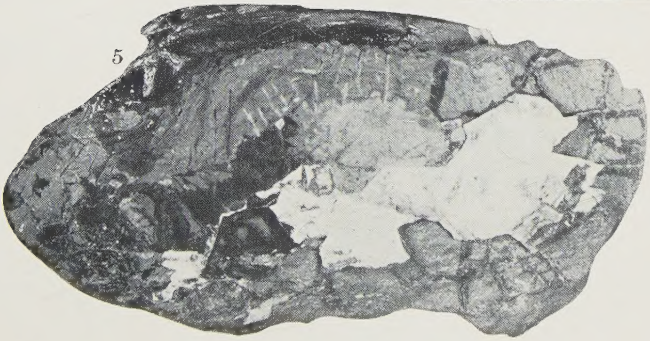

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Article 2. The object of the Society is the promotion of palaeontology and related sciences.

Article 3. This Society to execute the scheme outlined under Article 2, shall hold annual meetings and discussions.

Article 4. Proceedings of the Society and articles for publication shall be published through the Journal of the Geological Society of Japan. Separates and circulations will be sent to members of the Palaeontological Society who are not members of the Geological Society of Japan.

Article 5. The annual dues of this Society is two dollars for the foreign members of the Society.

Article 6. This Society shall hold the following executives. President one person, Councillors several persons.

Article 7. The President and Councillors shall be elected annually. The President and Councillors shall be elected from the Society body by vote of its members. All elections shall be ballot.

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